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ELECTRONIC MARKET DATA BOOK

1993

Electronic Industries Association, Washington, DC

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1993 EDITION
ELECTRONIC MARKET
DATA BOOK

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Prepared by the EIA Marketing Services Department

Foreword

It is impossible to imagine a world without electronics. The products of our industry touch the lives of every American every day. The continuous "electronics revolution" has spawned a myriad of products which:

- help defend our country
- entertain us
- help us run our businesses
- help inform us
- allow us to communicate, person-to-person,coast-to-coast, and around the world

The electronic content of many, many products - from autos to missiles - makes them more intelligent, more useful and more exciting. No other industry has a greater impact on our daily lives.

Furthermore, annual sales of electronics products are approaching the $300 billion mark. Exports have accounted for a significant portion of U.S. economic growth in recent years, and during 1992 the U.S. electronics industry exported nearly $80 billion. Almost two million Americans work in its factories and offices, and their productivity has shown continuous improvement. Consequently, we all have a vested interest in maintaining a strong and vibrant electronics industry in the U.S.

Overall, the industry's vital signs are excellent. Sales are up, R&D spending continues to increase and exports are on an upward trend. There are challenges, especially in the areas of defense conversion and in generating the profits necessary to allow the industry to continue to grow and innovate. EIA's fundamental mission remains the pursuit of those activities which will advance the growth and technological progress of the electronic industries in the U.S.

I invite you to peruse this 1993 edition of the *Electronic Market Data Book*, to discover the significance and contributions of this great industry. I also invite you to contact me with your ideas on how we might make it even greater.

Ron H. Barnhart
Chairman, EIA Board of Governors
Vice President, Business Development
Honeywell, Incorporated

We are in the midst of an electronic revolution. This has been the case since the first practical application of electronics at the beginning of this century. But it has never been more evident, and the pace of change continues to accelerate. New electronic technologies are set to once again significantly change the way we learn, work, and spend our leisure--increasing the flexibility and possibilities of our lives.

This revolution is not about a single great invention or innovation. For years the U.S. electronics industry has rapidly enhanced the performance and productivity of a great many consumer, communications, industrial, medical, and military products; while at the same time frequently offering progressively lower prices for superior technology.

Instead, the revolution we are currently witnessing is the achievement of a kind of "synergy," the often hoped for, but seldom achieved, joining of (in this case) advances in the myriad fields of electronics into new, exciting, and often "futuristic" products.

This **1993 Market Data Book** will introduce some of you for the first time to the world of "HDTV," "multimedia," "SMDs," and "MCMs." But you may already be experiencing, perhaps without being aware, technical advances in areas such as data compression, component design and packaging, and lasers, that are helping to shape the electronic revolution. These technologies enhance our everyday lives with new educational and communication tools, entertainment on demand, safer transportation, better medical equipment, and a more capable national defense.

New frontiers in electronics is precisely where U.S. industry excels. Over one-third of all U.S. industry funded Research and Development is invested by the electronics industry. And during the 1980s, our industry's commitment to the future deepened, as spending by the electronics industry on R&D grew at a faster rate than sales. It is the development of these new frontiers that will raise U.S. productivity and competitiveness, while setting the stage and providing the tools that will likely unleash a new era in economic and social development.

Because of its success, the U.S. electronics industry plays a unique role in expanding and shaping our future--opening new "worlds" that are often limited only by one's own ingenuity, imagination and foresight. It is a responsibility that weighs heavily in the work of our industry and the work of EIA.

Peter F. McCloskey
President, Electronic Industries Association

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The **1993 Market Data Book** would not have been possible without the extraordinary efforts of Shell Walser. Shell successfully lead the conversion of the Market Data Book to in-house EIA desk-top publishing layout and design. Her efforts will allow EIA and the Marketing Services Department the flexibility and opportunity to bring you a more informative, "user friendly" publication.

The contributions of the following other EIA staff are also gratefully acknowledged:

Michelle Bing	Horace Johnson
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Robyn Fox	Chris Pendleton
John Geron	Kevin Shannon
Tom Godsman	Michelle Spence
John Houk	Todd Thibodeaux

USING THE 1993 MARKET DATA BOOK

This year the Market Data Book has been completely revised and updated, to include:

- More graphs for a quick visual analysis of sales, trade, employment and other data
- Text sidebars highlighting market and technology trends
- Employment data by top states for individual electronics industries
- Time series on monthly sales, orders, inventories, and price indexes for major electronics sectors
- EIA electronic stock indexes showing stock movements for selected sectors
- New time series on economic indicators important to the electronics industry, including data on the U.S. government and macroeconomy, finance, manufacturing, international trade, and employment
- International profiles on over 30 countries, with statistics on economic trends, trade with the United States, and production and international trade (as available)

Each product chapter is arranged in sections showing:

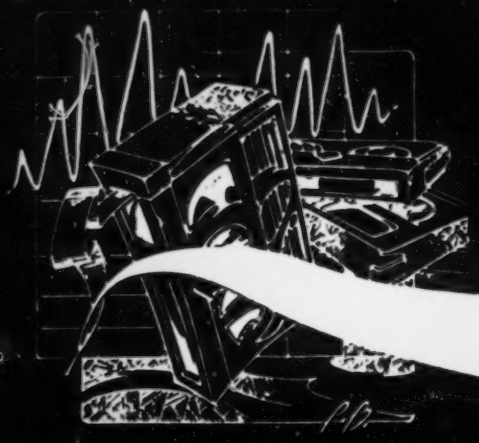
- Industry shipments/sales
- Trade Data
- Relevant economic data

Figures in the book are based on aggregate data provided by several hundred EIA companies, supplemented by selected government and private sources. Some of the data contained in this publication is available free or for a nominal fee from the Federal Government.

A glossary of terms and acronyms appears at the back of the book for convenient definitions of government/electronic terminology.

For additional information on the electronic industries or any topic covered in the **Electronic Market Data Book**, contact our Research Center at 202/457-8730 or 457-8757. Our professional research specialists provide customized research services at affordable prices.

While the **1993 Market Data Book** is substantially different from previous editions, it is still evolving to bring you the facts and figures you need on the electronic industries. Please complete the survey insert with your thoughts on the book, or contact Shell Walser (202/457-8741) with your comments and suggestions on how we can make the book more useful to you.



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The Consumer Electronics Group of the Electronic Industries Association offers a wealth of information in the form of videocassettes, books and pamphlets. Each tape, with its accompanying booklet, is prepared with the extensive assistance of experienced industry professionals to reflect the most recent electronic trends in devices, equipment and theory. Each topic is covered without respect to mastery level, so tapes are an invaluable resource for both beginners learning the basics and experts wishing to fine-tune their expertise.

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- Switching Power Supplies
- High Technology Soldering
- Operational Amplifiers
- Multi-channel Television Sound Systems
- Troubleshooting with Modern Test Equipment (Part I)
  The Oscilloscope
- Troubleshooting with Modern Test Equipment (Part II)
  General Test Instruments
- Troubleshooting Microprocessors

Car Audio Installation Tapes

- Basic Car Audio Installation
- Professional In-Dash Car Stereo Installation
- Professional Car Speaker Installation
- Professional Equalizer and Amplifier Installation

General Interest

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- Electronics - Back To Your Future (Career Guidance)
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Presented as a service to the industry by the Electronic Industries Association's Consumer Electronics Group

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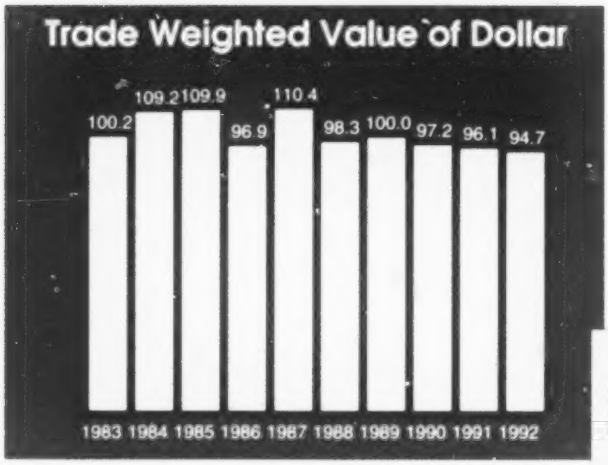

See section on "Trade & Foreign Production", p. 6-7.

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- *U.S. International Trade*
- *U.S. Employment*
- *Consumer Activity*
- *Economic Indicators*
- *Government Spending*
- *Manufacturing*
- *Financial Markets*

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ELECTRONICS BY INDUSTRY GROUP

U.S. Factory Sales ($ Million); 1983-1992

Table 1-1

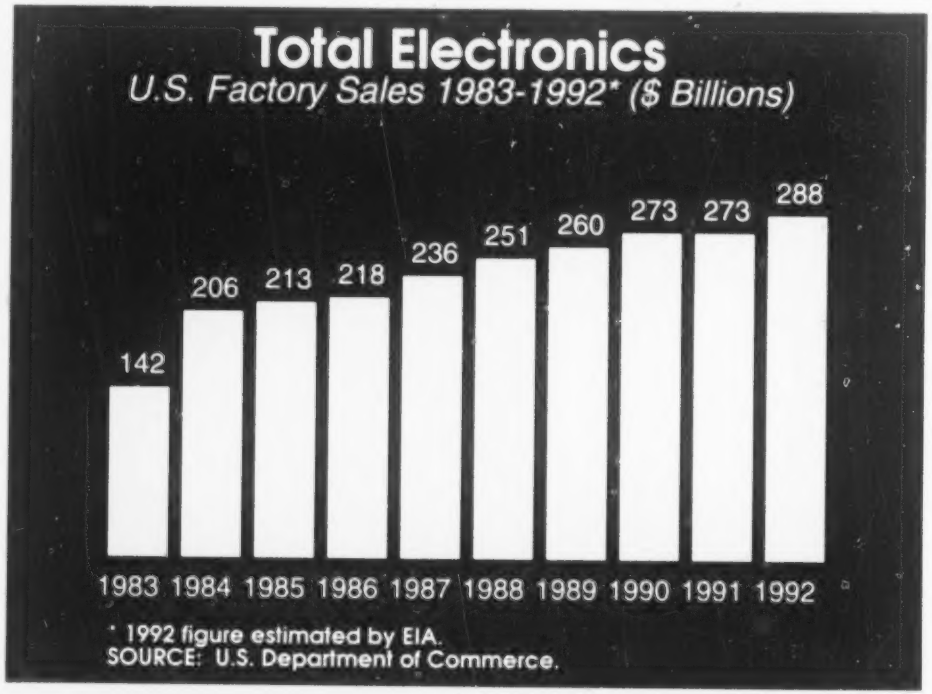
YEAR	Electronic Components	U.S.-Produced[1] Consumer Electronics	Telecommunication Equipment	Other Communications	Computers & Peripherals Equipment	Industrial Electronics	Electromedical Equipment	Other Related Products & Services	TOTAL
1983	33,935r	5,895	20,777	21,342	38,709	16,531	4,845	na	142,034
1984	43,417r	7,092	26,009	24,342	48,355	20,388	5,148	31,009	205,760
1985	39,670r	6,110	29,208	28,627	49,444	20,121	5,028	35,266	213,474
1986	38,063r	6,517	29,085	31,396	48,215	20,286	4,931	39,117	217,610
1987	45,454r	6,373	29,910	33,087	52,840	21,325	5,576	41,166	235,731
1988	51,165r	7,483	31,113	33,241	54,136	22,100	6,015	45,398	250,651
1989	56,469r	8,152	31,589	32,842	54,194	24,798	6,339	45,914	260,297
1990r	59,283	8,103	33,448	34,572	53,040	26,183	6,719	51,272	272,620
1991r	60,701	8,233	32,297	34,041	49,643	25,587	7,570	54,627	272,699
1992e	64,144	9,183	36,740	31,357	56,360	26,130	7,839	55,875	287,628

[1] Includes U.S.-produced audio, video, blank media products, and electronic toys. Refer to Table 2-1 for total sales of consumer electronics products including imports. Includes EIA estimate of the electronic content of aerospace and automotive equipment,and selected computer software and services.

na-Not Available

r-Revised.

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.



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TOTAL U.S. ELECTRONICS INDUSTRY

U.S. Macroeconomic Data ($ Millions), 1990-1992

Table 1-2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
FACTORY SALES													
1990	18,619	21,805	24,946	20,827	22,251	26,017	19,269	22,021	25,874	22,832	22,671	25,944	272,620
1991	18,618	21,038	24,128	20,777	21,995	25,838	19,212	22,194	25,627	23,058	24,089	26,124	272,699
1992	19,600	22,138	25,866	21,695	22,423	27,564	20,554	22,433	27,514	23,745	24,858	29,237	287,628
NEW ORDERS													
1990	16,945	18,837	22,271	18,997	19,953	21,608	17,289	18,081	22,042	19,932	18,496	23,095	237,546
1991	16,011	20,880	19,901	18,086	18,993	20,398	18,243	18,759	20,825	19,465	20,281	21,778	233,621
1992	18,342	19,066	21,937	18,717	20,027	22,833	17,914	19,006	24,424	21,548	21,948	28,135	253,898
INVENTORY													
1990	42,716	42,330	42,996	43,329	42,329	43,073	43,258	42,448	42,447	42,143	40,175	6,718	39,497
1991	40,225	40,617	40,036	40,757	40,703	39,659	40,394	40,269	39,422	39,437	38,868	37,549	39,828
1992	38,115	37,963	37,386	37,504	37,588	36,699	37,066	37,445	36,626	36,400	36,232	34,970	37,000

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
IMPORTS													
1990	5,410	5,184	6,031	5,795	5,529	6,053	6,215	6,149	5,961	6,767	6,400	6,162	71,656
1991	5,584	5,674	6,199	6,068	5,940	6,293	6,555	6,578	7,013	7,516	6,971	7,038	77,428
1992	5,999	6,246	7,254	6,670	6,629	7,571	7,457	7,706	8,184	8,422	8,098	8,195	88,431
EXPORTS													
1990	5,115	5,110	6,396	5,311	5,463	6,093	5,467	5,596	5,807	5,976	5,512	5,858	67,703
1991	5,855	5,543	6,820	6,032	6,090	6,255	5,649	5,728	6,121	6,337	6,282	6,214	72,926
1992	5,793	6,102	6,882	6,102	6,233	6,707	6,126	5,920	6,974	7,233	6,608	7,209	77,889

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Avg
FINISHED EQUIPMENT FACTORY PRICE INDEX (12/90=100)													
1990	102.2	101.8	101.3	101.0	100.9	100.8	100.6	100.5	100.6	100.5	100.4	100.0	100.9
1991	100.0	99.9	99.7	99.7	98.6	98.0	97.0	96.0	95.9	95.7	95.6	95.4	97.6
1992	95.1	95.2	95.0	94.5	94.5	94.2	94.0	94.0	93.8	93.9	93.7	93.8	94.3

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Avg
EIA MANUFACTURERS STOCK INDEX (1/91=100)													
1991	100.00	106.27	109.14	109.14	113.44	107.52	111.33	111.36	109.33	112.01	105.92	114.68	109.18
1992	119.35	121.96	115.06	115.42	112.47	107.63	108.97	113.43	115.49	116.30	115.29	118.62	115.00

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Deparment.

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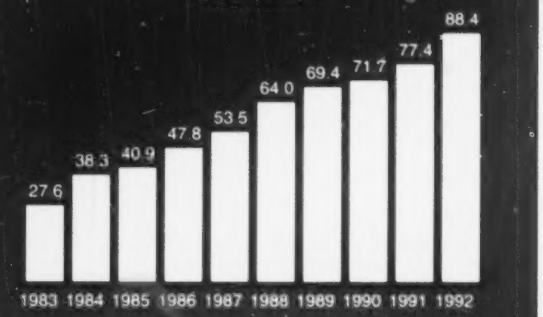
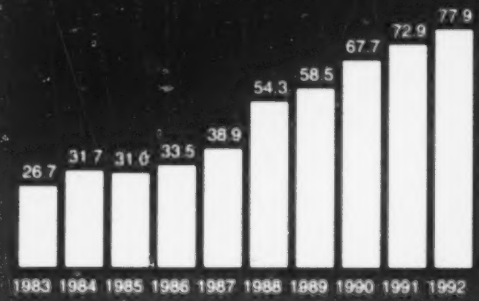
Total U.S. Electronics Imports
($ Billions)



SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

Total U.S. Electronics Exports
($ Billions)



SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

U.S. Electronics Imports
By Country 1992 ($ Billions)

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

U.S. Electronics Exports
By Country 1992 ($ Billions)

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

EIA Manufacturers Stock Index
(1/91=100)

TOTAL U.S. ELECTRONICS

U.S. Imports & Exports ($ Millions), 1983-1992

Table 1-3

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Imports	27,552	38,341	40,867	47,816	53,519	64,025	69,425	71,656	77,428	88,431
Exports	26,677	31,697	30,968	33,515	38,932	54,267	58,525	67,703	72,926	77,889
Balance of Trade	(875)	(6,644)	(9,899)	(14,301)	(14,587)	(9,758)	(10,900)	(3,953)	(4,502)	(10,542)

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Deparment

U.S. ELECTRONICS BY INDUSTRY

U.S. imports & Exports ($ Millions): 1990-1992

Table 1-4

Product Group	U.S. Imports			U.S. Exports		
	1990	1991	1992	1990	1991	1992
Electron Tubes	515	546	619	518	656	693
Passive Components	8,572	8,772	8,840	5,521	5,756	5,731
Solid State Products	12,183	13,119	15,489	13,482	14,504	16,180
Consumer Products	14,628	14,800	16,291	2,360	2,670	3,081
Telecommunications	7,492	7,276	8,279	6,932	7,331	8,453
Other Communications	919	1,030	1,120	2,473	2,584	2,496
Computers & Peripherals	22,905	26,623	32,384	27,774	28,835	30,355
Industrial Electronics	2,444	3,015	3,143	6,056	7,557	7,511
Electromedical Equipment	2,000	2,246	2,270	2,587	3,036	3,388

SOURCE: U.S. Department of Commerce

TOTAL U.S. ELECTRONICS EMPLOYMENT

(Thousands of Workers), 1988-1992

Table 1-5

	1988	1989	1990	1991	1992
All Employees	2,099.9	2,086.0	2,001.8	1,910.8	1,808.2
Production Workers	981.3	978.9	935.9	892.8	849.0
Women Employees	849.6	843.4	810.0	772.3	733.7
Wage Index (12/88=100)	101.5	104.0	107.7	112.3	116.3

SOURCE: U.S. Department of Labor, compiled by EIA Marketing Services Deparment

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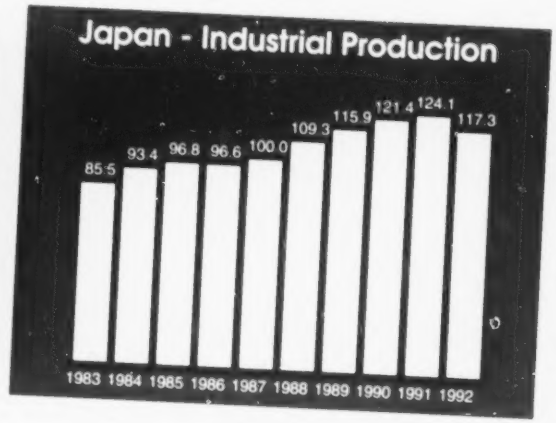
TRADE & FOREIGN PRODUCTION INDICATORS

Table 1-6

INDICATOR	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Trade Weighted Value of Dollar (1984=100)	100.2	109.2	109.9	96.9	110.4	98.3	100.0	97.2	96.1	94.7
Yen to Dollar Exchange Rate (Yen per Dollar)	237.4	237.6	238.5	168.5	144.6	128.1	138.0	144.8	134.6	127.0
Dollar to German Mark (German Mark per Dollar)	2.4	2.8	2.9	2.2	1.8	1.8	1.9	1.6	1.7	1.6
Exports of Goods and Services (Billions of 1987 Dollars)	285.9	305.7	309.2	329.6	364.0	421.6	471.8	510.0	539.4	573.2
Imports of Goods and Services (Billions of 1987 Dollars)	342.1	427.7	454.6	484.7	507.1	525.7	545.4	561.8	561.2	615.0
Merchandise Trade Deficit/Surplus (Billions of Current Dollars)	(52)	(107)	(118)	(138)	(152)	(119)	(109)	(102)	(65)	(84)
Industrial Production Japan (1982-84=100)	85.5	93.4	96.8	96.6	100.0	109.3	115.9	121.4	124.1	117.3
Industrial Production Germany (1982-84=100)	90.9	93.5	97.7	99.6	100.0	103.9	108.8	114.5	117.9	115.5
Industrial Production Canada (1982-84=100)	81.2	91.0	96.1	95.4	100.0	105.3	104.9	100.5	96.4	97.2



Footnotes For Trade & Foreign Production Indicators

INDICATOR	SOURCE
Trade Weighted Value of Dollar	Federal Reserve Board
Yen to Dollar Exchange Rate	Federal Reserve Board
Dollar to German Mark	Federal Reserve Board
Exports of Goods and Services	U.S. Department of Commerce
Imports of Goods and Services	U.S. Department of Commerce
Merchandise Trade Deficit/Surplus	U.S. Department of Commerce
Industrial Production Japan	Federal Reserve Board
Industrial Production Germany	Federal Reserve Board
Industrial Production Canada	Federal Reserve Board

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TRADE & FOREIGN PRODUCTION

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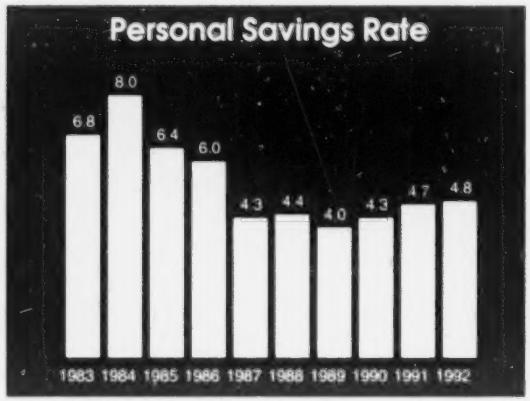
U.S. CONSUMER ACTIVITY INDICATORS

Table 1-7

INDICATOR	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Consumer Price Index - All Items (1982-84=100)	99.6	103.9	107.6	109.6	113.6	118.3	124.0	130.7	136.2	140.3
U.S. Retail Sales (Billions of Dollars)	1,168	1,285	1,375	1,450	1,539	1,644	1,742	1,808	1,834	1,933
Personal Consumption (Billions of 1987 Dollars)	2,619.4	2,746.1	2,865.8	2,969.1	3,052.2	3,162.4	3,223.3	3,260.4	3,240.8	3,314.0
Consumer Installment Credit (Billions of Current Dollars)	343.0	409.0	483.8	550.7	589.0	639.7	700.6	730.9	730.2	724.3
Consumer Confidence Index (1985=100)	71.1	80.7	79.2	79.0	80.2	82.0	80.3	80.2	79.1	81.1
Personal Savings Rate (% of Disposable Income)	6.8	8.0	6.4	6.0	4.3	4.4	4.0	4.3	4.7	4.8
Factory Shipments of Home Appliances (Millions of Units)	34.1	41.4	43.7	47.0	50.0	49.3	48.7	45.6	43.4	46.2
PCEs for Medical Care (Billions of 1987 Dollars)	332.6	341.9	353	366.2	384.7	399.4	408.6	423.9	438.8	455.8
Consumer Price Index - Medical Care (1982-84=100)	100.6	106.8	113.5	122.0	130.1	138.6	149.3	162.8	177.0	190.1



Footnotes For U.S. Consumer Activity Indicators

INDICATOR	SOURCE
Consumer Price Index - All Items	U.S. Department of Labor
U.S. Retail Sales	U.S. Department of Commerce
Personal Consumption	U.S. Department of Commerce
Consumer Installment Credit	U.S. Department of Commerce
Consumer Confidence Index	Conference Board
Personal Savings Rate (%)	U.S. Department of Commerce
Factory Shipments of Home Appliances	Assoc. of Home Appliance Mfgs.
PCEs for Medical Care	U.S. Department of Commerce
Consumer Price Index - Medical Care	U.S. Department of Labor

U.S. CONSUMER ACTIVITY

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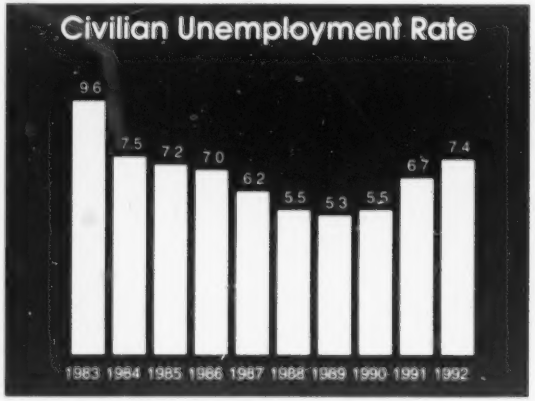
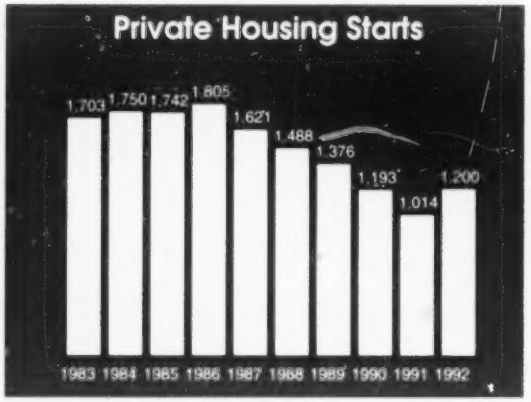
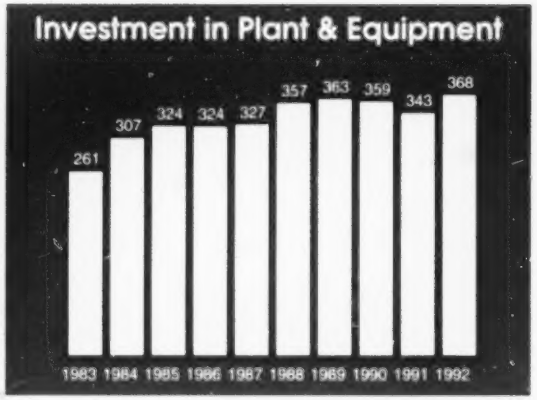
GENERAL U.S. ECONOMIC INDICATORS

Table 1-8

INDICATOR	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Index of Leading Indicators (1987=100)	116.2	121.7	124.0	132.4	140.1	142.4	145.0	143.8	143.4	148.8
Civilian Unemployment Rate (% of Civilian Labor Force)	9.6	7.5	7.2	7.0	6.2	5.5	5.3	5.5	6.7	7.4
Total Non-Agriculture Employment (Thousands of Workers)	90,200	94,496	97,519	99,525	102,200	105,536	108,329	109,782	108,310	108,437
Private Housing Starts (Thousands of Units)	1,703	1,750	1,742	1,805	1,621	1,488	1,376	1,193	1,014	1,200
Gross Private Investment (Billions of 1987 Dollars)	599.5	757.5	745.9	735.1	749.3	773.4	784.0	739.1	661.1	712.6
Investment in Plant & Equipment (Billions of 1987 Dollars)	260.5	307.4	324.4	323.7	326.5	356.8	362.5	359.0	342.6	368.2
Employee Benefit Cost Index (June 1989=100)	76.7	81.7	84.6	87.5	90.5	96.7	102.6	109.4	116.2	122.2
Gross Domestic Product (Billions of 1987 Dollars)	3,906.6	4,148.5	4,279.8	4,404.5	4,539.9	4,718.6	4,838.0	4,877.5	4,821.0	4,922.6







Footnotes for General U.S. Economic Indicators

INDICATOR	SOURCE
Index of Leading Indicators	U.S. Department of Commerce
Civilian Unemployment Rate	U.S. Department of Labor
Total Non-Agriculture Employment	U.S. Department of Labor
Private Housing Starts	U.S. Department of Commerce
Gross Private Investment	U.S. Department of Commerce
Investment in Plant & Equipment	U.S. Department of Commerce
Employee Benefit Cost Index	U.S. Department of Labor
Gross Domestic Product	U.S. Department of Commerce

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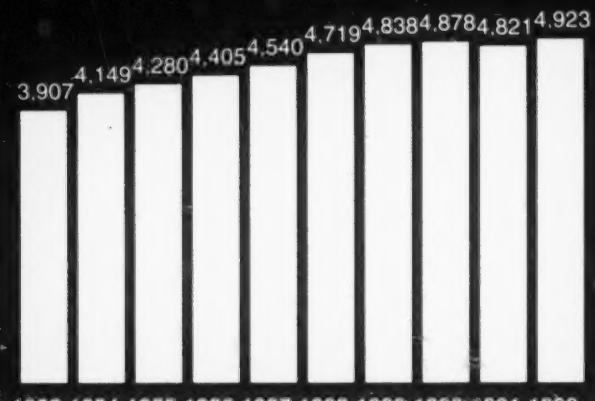
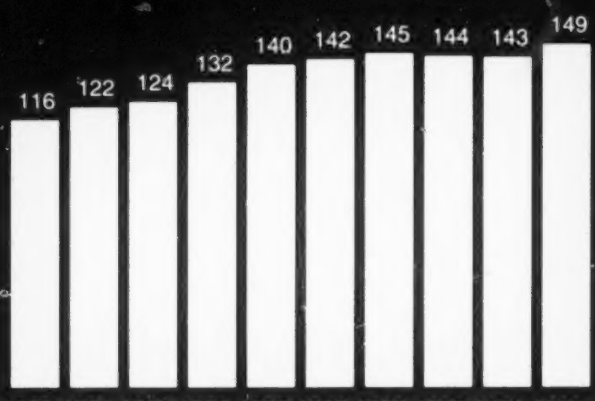
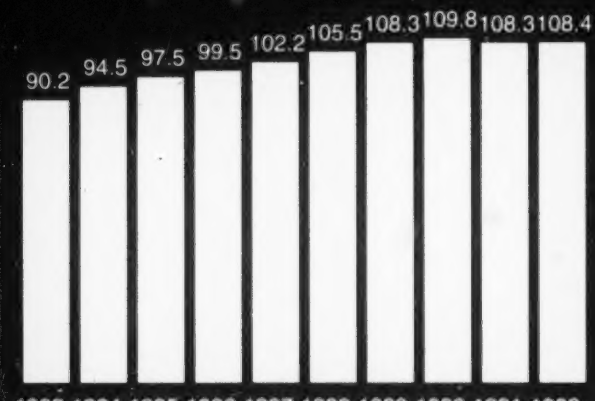
Gross Domestic Product



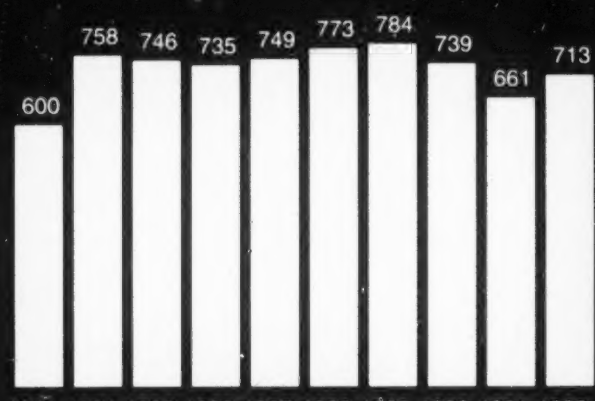
Index of Leading Indicators



Total Non-Agriculture Employment



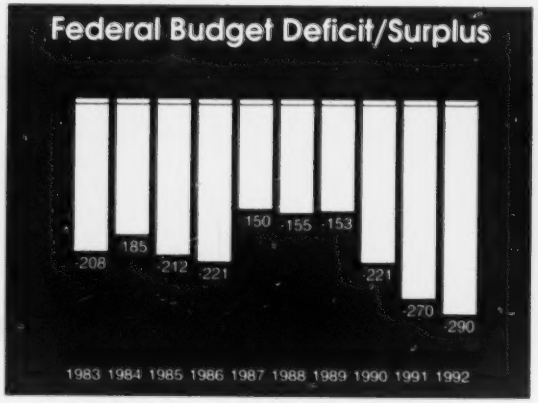
U.S. Gross Private Investment

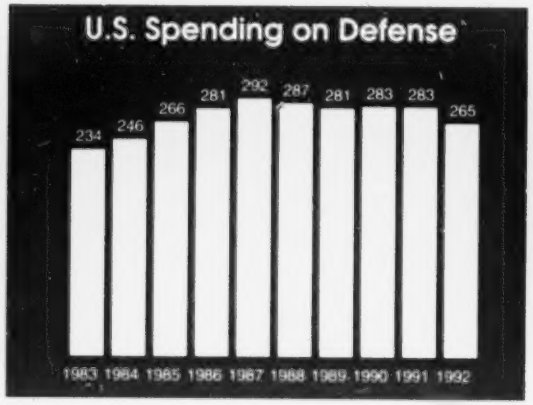


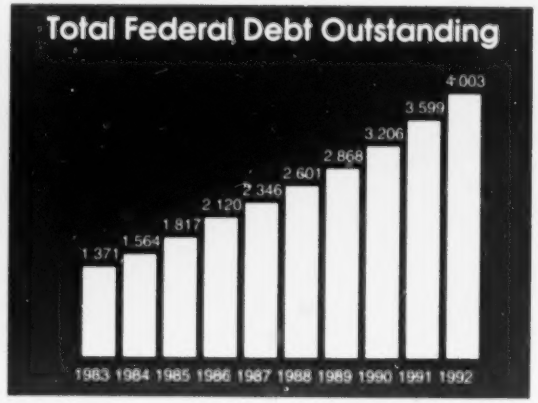
U.S. GOVERNMENT SPENDING INDICATORS

Table 1-9

INDICATOR	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Government Purchases (Billions of 1987 Dollars)	743.8	766.9	813.4	855.4	881.5	886.8	904.4	929.9	941	937.8
Federal Receipts (Billions of Current Dollars)	600.6	666.5	734.1	769.1	854.1	909.0	990.7	1,031.3	1,054.3	1,091.6
Federal Outlays (Billions of Current Dollars)	808.4	851.8	946.4	990.3	1,003.9	1,064.1	1,143.2	1,252.7	1,323.8	1,381.8
Federal Budget Deficit/Surplus (Billions of Current Dollars)	(208)	(185)	(212)	(221)	(150)	(155)	(153)	(221)	(270)	(290)
U.S. Government Spending on Defense (Billions of Dollars)	234.2	245.8	265.6	280.6	292.1	287	281.4	283.3	282.8	265
Total Federal Debt Outstanding (Billions of Current Dollars)	1,371	1,564	1,817	2,120	2,346	2,601	2,868	3,206	3,599	4,003
Net Interest on Federal Debt (Billions of Current Dollars)	90	111	130	136	139	152	169	184	195	199







Footnotes for U.S. Government Spending Indicators

INDICATOR	SOURCE
Government Purchases	U.S. Department of Commerce
Federal Receipts	Department of the Treasury
Federal Outlays	Department of the Treasury
Federal Budget Deficit/Surplus	Department of the Treasury
U.S. Government Spending on Defense	U.S. Department of Commerce
Total Federal Debt Outstanding	Department of the Treasury
Net Interest on Federal Debt	Department of the Treasury

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U.S. GOVERNMENT SPENDING

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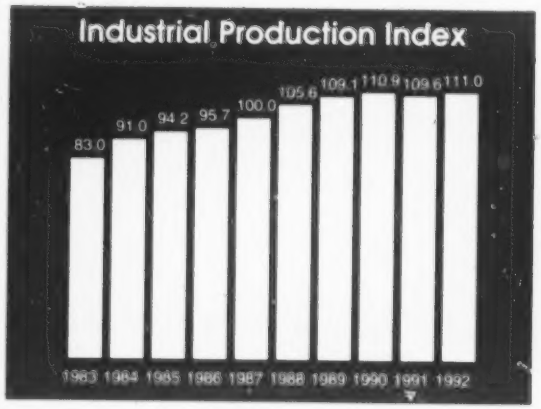
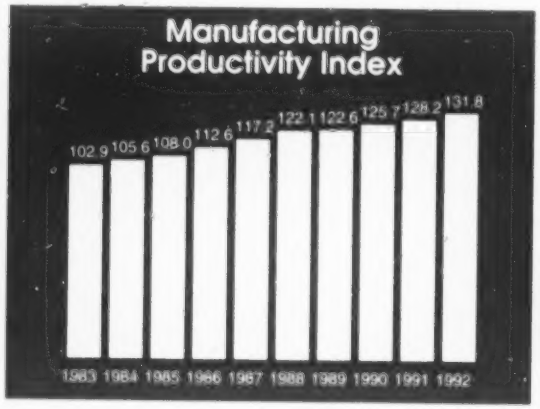
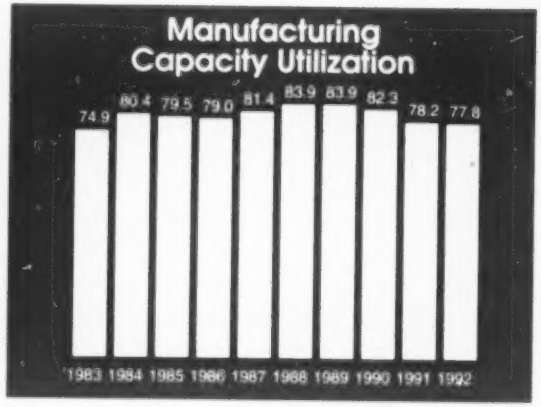
U.S. MANUFACTURING ACTIVITY INDICATORS

Table 1-10

INDICATOR	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Industrial Production Index (1987=100)	83.0	91.0	94.2	95.7	100.0	105.6	109.1	110.9	109.6	111.0
Manufacturing Productivity (1987=100)	102.9	105.6	108.0	112.6	117.2	122.1	122.6	125.7	128.2	131.8
Manufacturing Capacity Utilization (% of Available Capacity)	74.9	80.4	79.5	79.0	81.4	83.9	83.9	82.3	78.2	77.8
Producer Price Index - Finished Goods (1982=100)	101.6	103.7	104.7	103.2	105.4	108.0	113.6	119.2	121.7	123.2
Factory Sales of Automotive Products (Billions of Current Dollars)	148	182	193	199	206	222	226	215	206	236
Factory Sales of Aerospace Products (Billions of Current Dollars)	75	79	91	102	104	108	113	125	130	126







Footnotes For U.S. Manufacturing Activity Indicators

INDICATOR	SOURCE
Industrial Production Index	Federal Reserve Board
Manufacturing Productivity	U.S. Department of Labor
Manufacturing Capacity Utilization	Federal Reserve Board
Producer Price Index - Finished Goods	U.S. Department of Labor
Factory Sales of Automotive Products	U.S. Department of Commerce
Factory Sales of Aerospace Products	U.S. Department of Commerce

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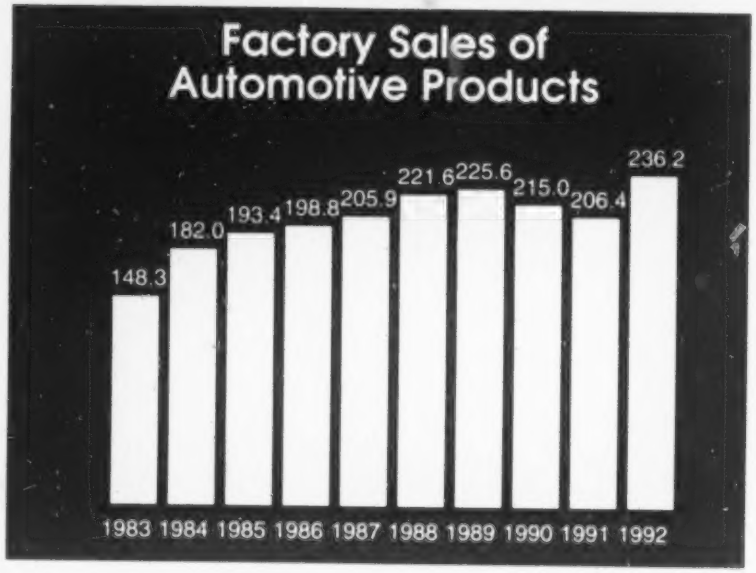

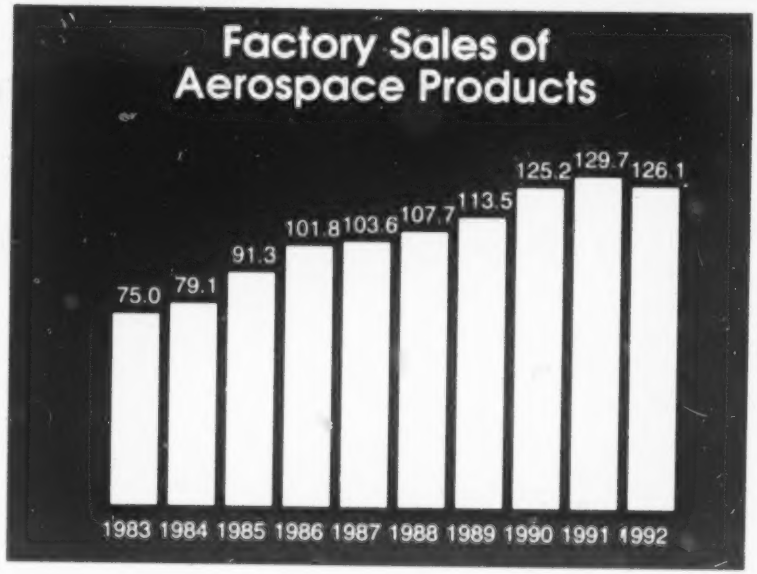

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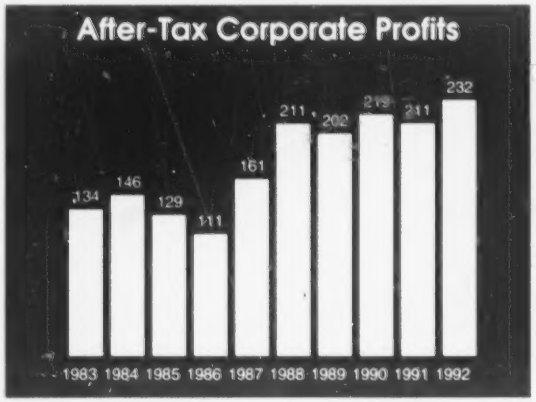
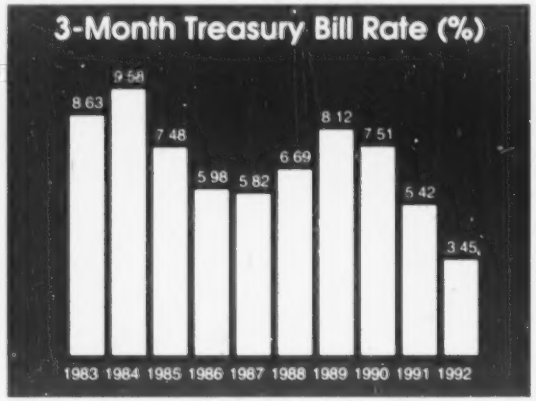
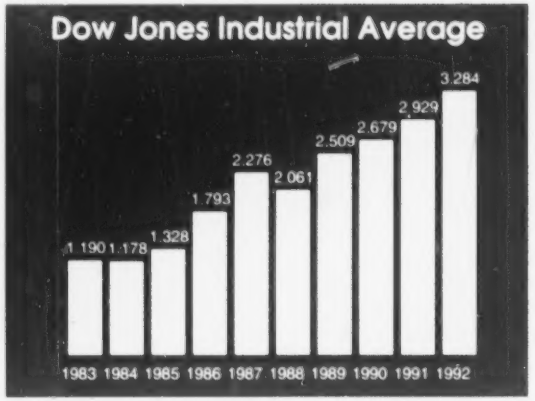
U.S. FINANCIAL MARKET INDICATORS

Table 1-11

INDICATOR	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
After-Tax Corporate Profits (Billions of Current Dollars)	133.5	146.4	128.5	111.3	160.8	210.5	201.6	218.7	210.7	231.8
Money Stock M2 (Billions of Current Dollars)	2,187	2,376	2,572	2,816	2,917	3,078	3,233	3,346	3,446	3,497
3-Month Treasury Bill Rate (%--Interest Rate)	8.63	9.58	7.48	5.98	5.82	6.69	8.12	7.51	5.42	3.45
Prime Rate (%--Interest Rate)	10.79	12.04	9.93	8.33	8.21	9.32	10.87	10.01	8.46	6.25
S&P 500 Stock Index (1941-43=100)	160.41	160.46	186.84	236.34	286.83	265.79	322.84	334.59	376.18	415.74
Dow Jones Industrial Average (1932=100)	1,190.34	1,178.48	1,328.23	1,792.76	2,275.99	2,060.82	2,508.91	2,678.94	2,929.33	3,284.29







Footnotes For U.S. Financial Market Indicators

INDICATOR	SOURCE
After-Tax Corporate Profits	Federal Reserve Board
Money Stock M2	Federal Reserve Board
3-Month Treasury Bill Rate (%)	Federal Reserve Board
Prime Rate (%)	Federal Reserve Board
S&P 500 Stock Index	S&P
Dow Jones Industrial Average	Dow Jones

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U.S. FINANCIAL MARKETS

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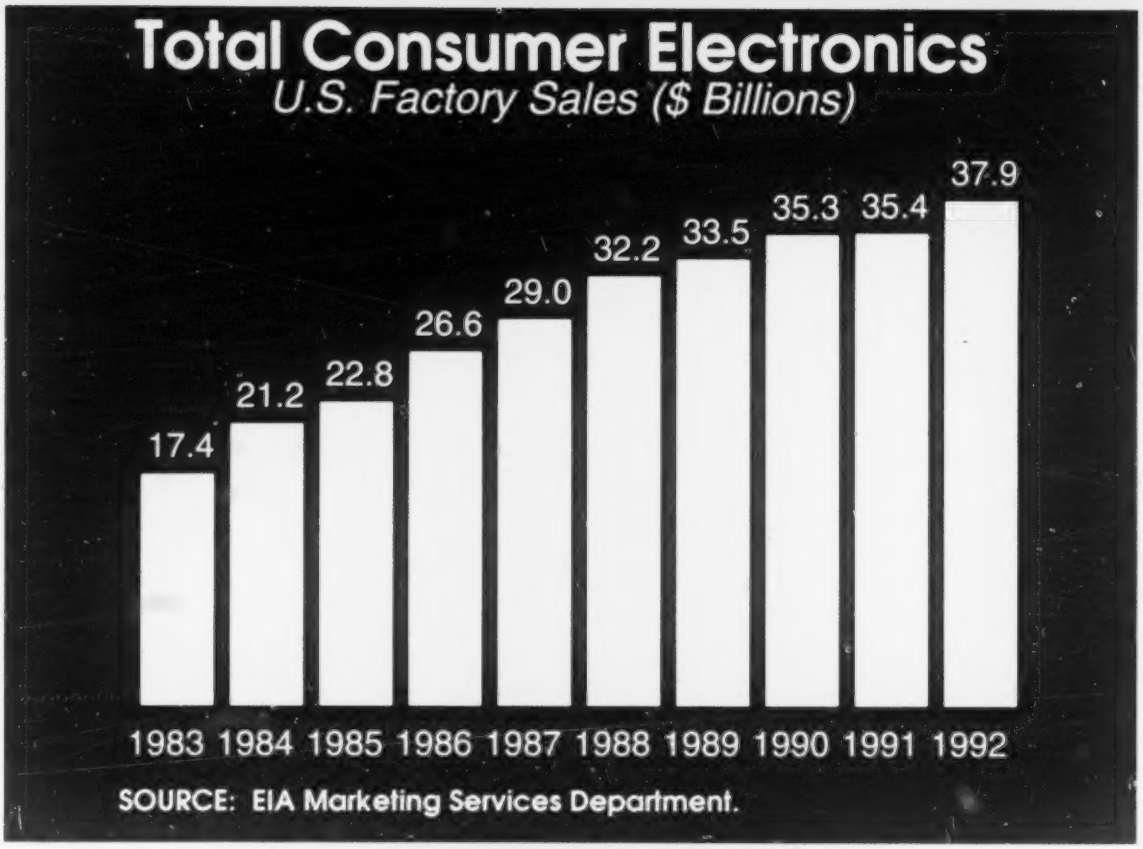

IN THIS CHAPTER

- ***Video***
- ***Audio***
- ***Accessories***
- ***Home Information***
- ***Blank Media***
- ***Trade***
- ***Employment***
- ***Demographics***

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Table 2-1

CONSUMER ELECTRONICS

U.S. Factory Sales--Including Imports: (Millions of Dollars), 1983-1992

CATEGORY	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
VIDEO										
Direct-View Color TV	4,889	5,377	5,514	5,844	6,282	6,247	6,490	6,197	5,979	6,591
LCD Color TV			7	14	21	30	40	50	56	60
Projection TV	268	385	488	530	527	529	478	626	683	714
TV/VCR Combinations								178	265	375
Monochrome TV	465	419	308	333	328	196	116	99	61	47
LCD Monochrome TV						40	40	33	31	32
VCR Decks	2,162	3,585	4,173	3,978	3,442	2,848	2,625	2,439	2,454	2,947
Camcorders	303	355	793	1,338	1,651	1,972	2,007	2,260	2,013	1,841
Laserdisc Players	81	45	23	26	26	34	50	72	81	88
Home Satellite Earth Stations				256	304	331	365	421	408	375
Videocassette Players						57	63	65	71	49
AUDIO										
Audio Systems	630	976	1,372	1,370	1,048	1,225	1,217	1,270	1,264	1,371
Separate Audio Components	1,283	913	1,132	1,358	1,715	1,854	1,871	1,935	1,805	1,586
Home Radios	565	661	379	408	409	377	379	360	310	324
Portable Audio Equipment	1,102	1,191	1,140	1,389	1,469	1,547	1,595	1,645	1,780	2,096
Aftermarket Autosound Equipment	1,900	2,484	961	1,035	1,023	1,187	1,125	1,192	1,232	1,467
Factory Installed Autosound			1,800	2,100	2,500	2,750	3,000	3,100	2,875	2,990
HOME INFORMATION										
Cordless Telephones	400	460	280	295	435	681	830	855	1,233	1,343
Corded Telephones	525	790	630	561	461	441	532	627	599	654
Telephone Answering Devices	190	230	325	464	607	755	838	842	928	1,006
Cellular Telephones		50	115	266	267	430	653	1,260	1,070	1,275
Home Computers	1,950	2,250	2,050	2,890	2,920	3,150	3,500	3,795	4,160	4,524
Personal Wordprocessors				580	620	650	688	656	600	555
Home Fax Machines							188	219	220	247
Home Security Systems					790	900	1,000	1,150	1,250	1,250
BLANK MEDIA										
Blank Audio Cassettes	234	256	270	300	375	354	367	376	373	376
Blank Videocassettes	486	771	1,055	1,235	1,006	936	923	948	980	872
Blank Floppy Diskettes						258	297	314	357	371
ACCESSORIES										
Electronic Accessories					748	847	829	793	721	768
Batteries						1,570	1,375	1,529	1,570	1,695
Grand Total	17,433	21,198	22,815	26,570	28,984	32,196	33,481	35,306	35,429	37,889

SOURCE: EIA Marketing Services Department

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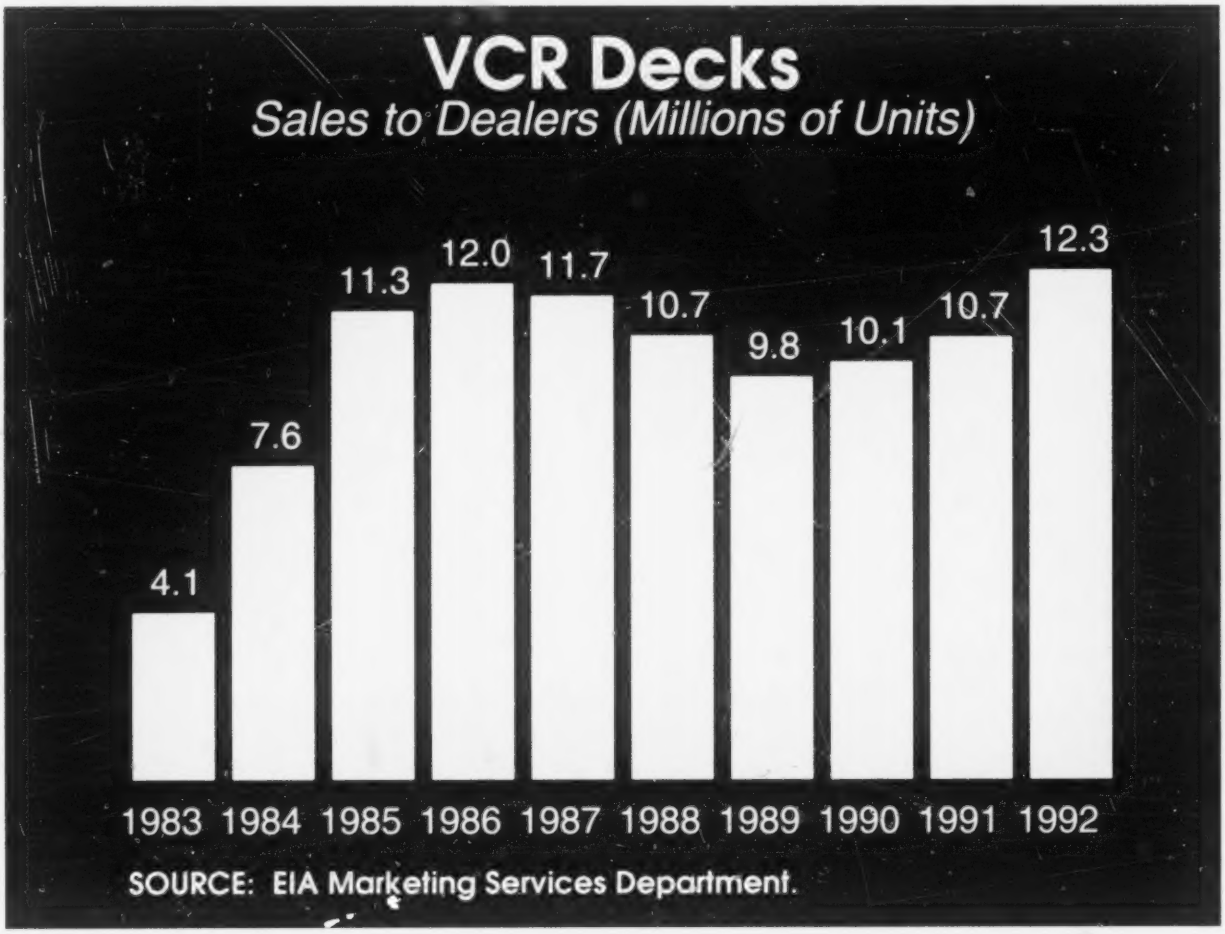
U.S. SALES/SHIPMENTS

VIDEO PRODUCTS **Table 2-2**

U.S. Sales to Dealers (Thousands of Units), 1983-1992

YEAR	PORTABLE & TABLE COLOR TV	CONSOLE COLOR TV	STEREO COLOR TV	MONOCHROME TV	VCR DECKS	LASERDISC PLAYERS
1983	11,179	2,807	na	5,697	4,091	na
1984	13,092	2,991	na	4,909	7,616	na
1985	13,993	3,002	na	3,754	11,336	na
1986	15,399	2,805	na	3,959	12,005	na
1987	16,805	2,525	4,349	3,570	11,702	na
1988	17,768	2,448	5,090	2,580	10,748	na
1989	19,557	2,149	6,043	1,656	9,760	120
1990	18,453	1,931	6,655	1,411	10,119	168
1991	17,951	1,523	7,377	784	10,716	206
1992	19,717	1,339	8,534	633	12,329	212

Figures include distributor sales and factory direct sales to dealers; see dollar figures table 2-3
na - Not Available
SOURCE: EIA Marketing Services Department



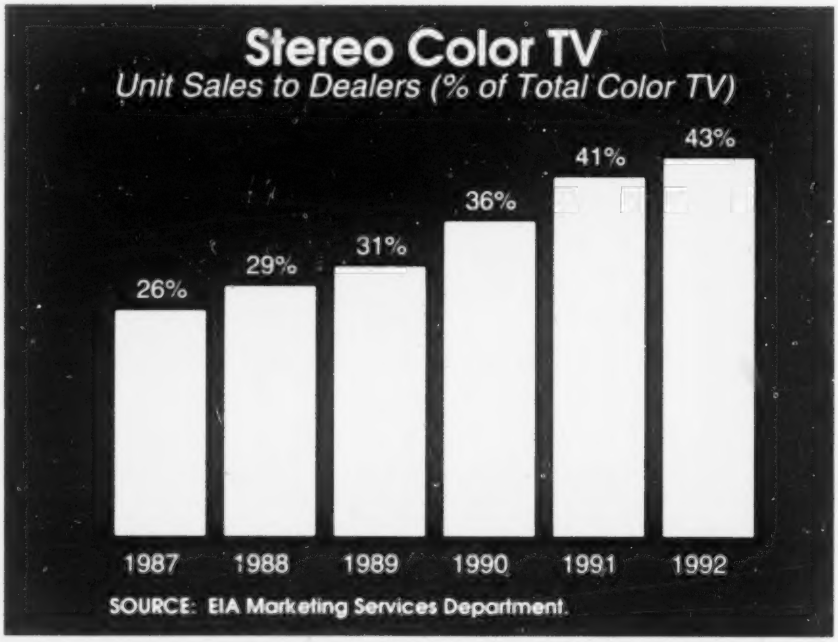
U.S. SALES/SHIPMENTS

VIDEO PRODUCTS Table 2-3

U.S. Dollar Sales ($ Millions), 1983-1992

YEAR	PORTABLE & TABLE TV	CONSOLE TV	STEREO COLOR TV	MONOCHROME TV	VCR DECKS	LASERDISC PLAYERS
1983	3,443	1,443	n/a	465	2,162	na
1984	3,875	1,484	n/a	419	3,585	na
1985	4,114	1,408	n/a	308	4,173	na
1986	4,481	1,355	n/a	333	3,978	na
1987	4,890	1,257	n/a	328	3,442	na
1988	4,691	1,217	2,428	196	2,848	na
1989	5,359	1,062	2,737	116	2,625	80
1990	5,148	950	2,928	99	2,439	72
1991	5,134	818	3,209	61	2,454	81
1992	5,757	754	3,729	47	2,947	88

Figures represent factory sales price multiplied unit sales to dealers
na - Not Available
SOURCE: EIA Marketing Services Department



WIDE-SCREEN ON THE WAY

U.S. consumers will not have to wait for the arrival of HDTV (see "Advanced Television") to enjoy the panoramic-like pictures of wide-screen color TV in their homes. The first color TVs with 16:9 aspect ratio picture tubes are scheduled to be on the market this year.

These feature-loaded color sets will have line-doubling for sharper images, picture-in picture displays, stereo, and remote control. In addition, they will be designed to accept adaptors for the reception and display of true HDTV signals.

A broad array of wide-screen programming is already available in the form of so-called letterboxed films and special material on prerecorded videodiscs and videocassettes. Letterboxing allows for movies to be shown on TV just as they were in theaters. When shown on standard 4:3 aspect ratio color TVs, letterboxed programs fill about 60% of the screen height, and have black bars across the top and bottom. On wide-screen TVs letterboxed programs fill the entire display.

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ADVANCED TELEVISION

With the application of digital signal processing technology to the home receiver, the age of advanced TV has begun. Several digital transmission systems are under review and the United States is leading the world in advanced television systems.

In addition to typical program material, digital High Definition TV (HDTV) signals will also have the capacity to carry packets of computer data; opening broad new communications opportunities, and leading to new kinds of interactive video services. HDTV, when it arrives, will bring with it true double-resolution TV Displays, nearly equal in quality to that of 35mm film, plus top quality digital stereo sound.

If the FCC's announced schedule is adhered to, all HDTV system laboratory and field tests will be completed this summer, and an HDTV broadcast standard selected by year-end. But technology doesn't stand still, and the process may be briefly delayed in the interest of insuring that the best possible standard is set.

PROJECTION TV Table 2-4

U.S. Sales to Dealers (Thousands of Units & $ Millions) 1983-1992

YEAR	SALES TO DEALERS[1]	DOLLAR SALES
1983	144	268
1984	195	385
1985	266	488
1986	304	530
1987	293	527
1988	302	529
1989	265	478
1990	351	626
1991	380	683
1992	404	714

[1] Includes distributor sales and factory direct sales to dealers.
na - Not Available
SOURCE: EIA Marketing Services Department

PROJECTION TV

A vast majority of TV manufacturers feature at least one giant-screen projection color TV model. In 1992, sales reached a record 404,000 units -- an impressive achievement considering it was also a record year for large screen direct-view color models.

New configurations and styles of projection television make these systems increasingly attractive to consumers. There are currently three major types of projection TV with screen sizes from about 35 inches to more than 10 feet in diagonal measurement.

Long in development, and now a reality, are color video projectors that use liquid crystal displays as light valves. Compactness is the hallmark of this new generation of video projectors. The largest take up no more table top space than a 19-inch TV and can be stored in a cabinet when not in use.

U.S. SALES/SHIPMENTS

TV/VCR COMBINATIONS Table 2-5

U.S. Sales to Dealers (Thousands of Units & $ Millions) 1990-1992

YEAR	SALES TO DEALERS[1]	DOLLAR SALES
1990	424	178
1991	662	265
1992	936	375

[1] Includes distributor sales and factory direct sales to dealers
SOURCE: EIA Marketing Services Department

TV/VCR COMBINATIONS

Once considered a specialty product suited primarily for commercial use, TV/VCR combinations are now a video hardware staple. Sales of TV/VCRs jumped more than 40% in 1992, and approached the one million mark.

While combinations with 13/14-inch screens still account for the majority of sales, demand for 19/20-inch models rose rapidly last year. TV/VCRs big attraction is they combine the functions of the industry's two best selling products in a simplified and affordable one-piece package that takes up little more space than a comparable sized TV alone. They are popular as second-sets for bedrooms and kitchens, and models designed for 12-volt DC operations are becoming the video entertainment systems of choice for many recreational vehicle and pleasure boat owners.

CAPTIONING

The evolution of the TV took another major step forward in 1990 when Congress passed, and the President signed into law, a bill mandating the inclusion of closed-caption decoders in all color sets with screen sizes of 13-inches or larger, manufactured or imported after July 1, 1993.

Captions are regularly transmitted along with most news and prime-time entertainment programming to make TV more accessible to the hearing-impaired. They are sent in an otherwise unused portion of the TV signal and appear on the screen as text, much like the printed translations often placed on the bottom of the picture of foreign language films.

Until this point, viewing captions required the purchase of a special separate decoder. Since they included tuners and other circuitry that essentially duplicated the functions of the TV set itself, such decoders were quite costly. The inclusion of captioning decoders in nearly all new color TVs from this year on means captions will, for the first time, be easily accessible and affordable to all.

As the number of TV homes with decoder-equipped sets expands, program-related captions are expected to become an important tool for helping children learn to read and the foreign-born to become literate in English. Additionally, expanded services such as statistical displays during sports shows, secondary analysis of cultural and news events or messages of particular interest to select groups will also become available. Captions may also offer a new way for broadcasters to deliver emergency announcements or other important messages to viewers, or to provide English translations of foreign-language programming.

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U.S. SALES/SHIPMENTS

CAMCORDERS Table 2-6

U.S. Sales to Dealers (Thousands of Units & $ Millions) 1985-1992

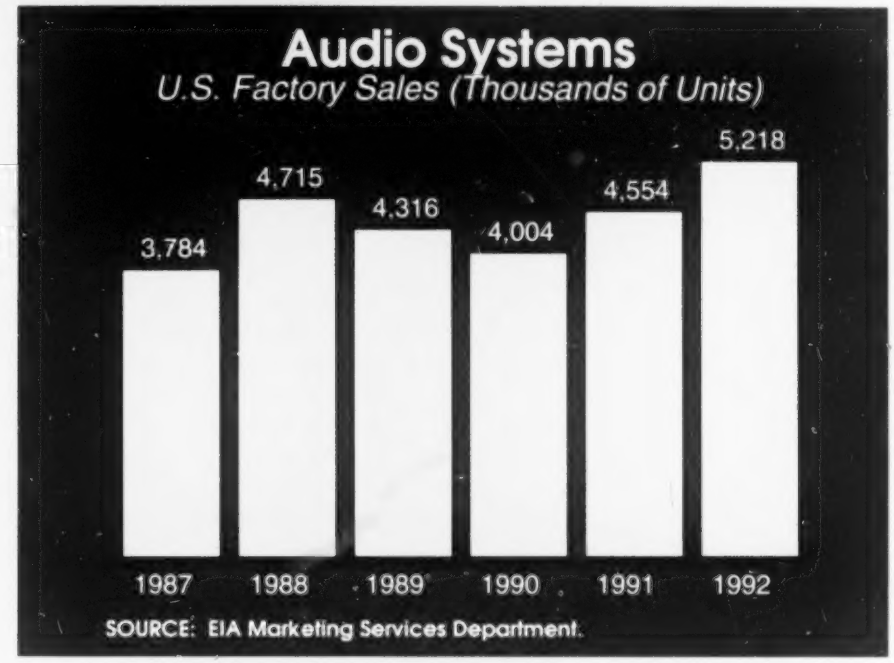
YEAR	SALES TO DEALERS[1]	DOLLAR SALES
1985	517	565
1986	1,169	1,338
1987	1,604	1,651
1988	2,044	1,972
1989	2,286	2,007
1990	2,962	2,260
1991	2,864	2,013
1992	2,815	1,841

[1] Includes distributor sales and factory direct sales to dealers.
na - Not Available
SOURCE: EIA Marketing Services Department

CAMCORDERS

While camcorder sales slipped slightly in 1992, all the decline came in full-sized VHS models; sales of compacts--VHS-C and 8mm models--increased. Last year compacts accounted for some 75% of sales. Full-size VHS camcorders have the advantage of using cassettes that are directly compatible with most home VCRs. However, more and more, consumers are opting for compact models as their smaller size and lighter weight make them easier to carry to family gatherings and special events.

U.S. SALES/SHIPMENTS



AUDIO SYSTEMS **TABLE 2-7**

U.S. Factory Sales (Thousands of Units and $ Millions); 1983-1992

	COMPACT SYSTEMS		RACK SYSTEMS		TOTAL	
YEAR	UNITS	DOLLARS	UNITS	DOLLARS	UNITS	DOLLARS
1983	2,623	452	403	178	3,026	630
1984	1,678	246	1,540	730	3,218	976
1985	2,532	325	2,335	1,047	4,867	1,372
1986	2,690	320	2,158	1,050	4,848	1,370
1987	2,315	326	1,469	722	3,784	1,048
1988	3,049	336	1,666	889	4,715	1,225
1989	2,878	470	1,438	747	4,316	1,217
1990	2,447	466	1,557	804	4,004	1,270
1991	3,139	597	1,415	667	4,554	1,264
1992	3,877	756	1,341	614	5,218	1,370

SOURCE: EIA Marketing Services Department.

LOUDSPEAKERS

The next frontier for loudspeaker manufacturers is the development of high-quality wireless loudspeakers, particularly for use in home theater installations. Several manufacturers have introduced small wireless speakers for limited applications. These speakers receive signals in the form of analog radio frequencies from a base device attached to a receiver or power amplifier. Still in development are wireless loudspeakers that employ digital signal transmission for noise-free connections to electronic components.

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DIGITAL AUDIO

Before CDs, virtually all consumer sound reproduction was either on analog vinyl records or tapes. In theory, analog playback devices should be able to reproduce exactly what was recorded by sound engineers. However, physical limitations in analog equipment, such as imperfections on the surface of record albums and ambient hiss inherent in blank audio tape, often mask subtleties in the music and detracts from the listening experience.

Digital recording and playback devices eliminate those limitations by "sampling" the music information at specific points on the sound wave and record it as binary numbers. The technology works in much the same way computers process information and, in effect, digital audio components are really small computers dedicated to one task: reproducing music just as it was recorded.

Two new entrants into the consumer digital audio market are Digital Compact Cassette and MiniDisc.

DCC and MD

Digital Compact Cassette (DCC) and MiniDisk (MD) represent two different philosophies in audio product development. DCC is a tape format based in part on the existing analog cassette. DCC recorders can record and play digitally, but they will also play back conventional analog cassettes.

MD, on the other hand, records digitally on a 2.5-inch magneto-optical disc. The first MD recorders have been personal and car stereos, although home MD decks are expected this year. Portable MD recorders all contain solid state memory that stores a few seconds of audio at a time as a buffer, to prevent skipping that can result from jolts and bumps. A single MD can record up to 74 minutes of digital audio.

The first DCC home decks and MD personal stereos went on sale in the United States late last year, along with prerecorded and blank software.

PORTABLE AUDIO EQUIPMENT Table 2-8

U.S. Factory Sales (Thousands of Units and $ Millions); 1987-1992

YEAR	TAPE & RADIO/TAPE PLAYERS[1] UNITS	DOLLARS	TAPE & RADIO/TAPE RECORDERS[2] UNITS	DOLLARS	PORTABLE CD EQUIPMENT[3] UNITS	DOLLARS
1987	13,830	415	24,336	852	903	164
1988	15,010	447	19,885	776	1,541	324
1989	16,648	473	21,169	819	1,929	304
1990	17,117	465	18,851	727	3,186	453
1991	17,740	504	16,985	639	4,681	639
1992	16,319	437	17,585	602	8,341	1,057

[1] Includes portable tape players and radio/tape players.
[2] Includes tape only recorders and radio/tape recorders .
[3] Includes portable CD players and radio/tape/CD recorders.
SOURCE: EIA Marketing Services Department.

U.S. SALES/SHIPMENTS

MULTIMEDIA and CD-ROM

Multimedia refers to the integration of text, video, graphics and audio. Multimedia systems are interactive, encouraging the user to be more involved. However, as the market develops, the ultimate forms of multimedia remain up for debate.

Most computer manufacturers see multimedia as an enhanced capability of the PC, with the monitor as the center of attention. To the computer industry, multimedia has become an important way to differentiate models and add capabilities. The consumer electronics world, on the other hand, tends to view multimedia as a new, dedicated, home entertainment unit that interacts with traditional video equipment.

An integral part of multimedia, computer CD-ROM discs, resemble audio CDs and store huge amounts of audio, text and graphics. Several groups of manufacturers are backing different approaches to computer-based multimedia, each with their own incompatible CD-ROM based systems.

The most common type of CD-ROM software developed for multimedia computers includes reference libraries--encyclopedias, dictionaries--and children's titles. Texts are brought to life with photos, drawings, animation, and sound.

A growing market for multimedia will increase sales of not only CD-ROM drives, memory boards, sound boards, and hard-disk drives, but also CD-ROM software at retail. Since multimedia customers will want to see and hear their new software as clearly as possible, sales of high-quality color monitors and self-powered speakers are also expected to climb.

HOME THEATER SYSTEMS

The arrival of high quality, bigger-screen direct-view and projection color TVs, plus stereo audio, has launched a new market phenomena, the home theater experience. The impact of the enhanced sight and sound available from video and audio equipment today can approximate the entertainment atmosphere that until now could only be found in the most modern movie theaters. Recreating at least the basics of a theater at home requires only a larger-screen TV equipped with hi-fi quality stereo and surround sound.

Consumers can put together a home theater system by selecting individual parts offered under many video and audio brands. To make the task somewhat simpler, many manufacturers offer a variety of complete packaged systems, along with the cabinetry needed to house them. Alternatively, consumers can visit a different type of retailer, one specializing in custom home theater installations. A qualified custom installer will tailor a system to meet specific customer requirements, including built-in installation if desired.

The price of a home theater system can vary from several hundred dollars for the basics to $15,000 or more, depending on the features and quality levels of the included components, and the cost of the furniture or custom installation. Most one-brand systems offer a unified remote control, while purchasers of multi-brand or custom installed systems can enjoy the same single-unit control by adding one of the multi-product programmable or preprogrammed remotes offered as an accessory by a number of manufacturers.

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U.S. SALES/SHIPMENTS

HOME RADIOS Table 2-9

U.S. Factory Sales (Thousands of Units and $ Millions): 1983-1992

YEAR	TABLE RADIOS		CLOCK RADIOS		PORTABLE RADIOS	
	UNITS	DOLLARS	UNITS	DOLLARS	UNITS	DOLLARS
1983	930	23	12,443	230	26,123	311
1984	1,354	23	16,316	299	28,783	339
1985	677	14	9,968	204	10,929	161
1986	337	7	11,330	198	13,696	203
1987	149	3	13,716	219	14,245	187
1988	170	6	12,425	199	11,028	172
1989	419	15	15,387	217	9,447	147
1990	357	11	11,497	196	9,731	152
1991	198	8	10,958	175	7,374	128
1992	133	4	12,689	183	8,731	137

SOURCE: EIA Marketing Services Department

AUTOSOUND

In 1992 more than 95% U.S. produced cars were installed with some sort of radio equipment and more than 66% were installed with AM/FM stereo receivers in combination with a cassette player.

During the Spring of 1993 digital display tuners used by the Radio Broadcast Data System (RBDS) are expected to be ready for sale. RBDS will provide digital quality sound from the radio and allows for a conventional FM radio broadcast to carry digital data "piggyback" on an inaudible subcarrier, including:

- call letters of the radio station
- current program format
- alternate frequencies (for translators)
- emergency weather and traffic notification
- paging information
- navigation data and business data

AUTOSOUND Table 2-10

U.S. Factory Sales (Thousands of Units and $ Millions); 1987-1992

YEAR	UNITS	DOLLARS
1987	12,826	1,023
1988	13,808	1,187
1989	11,394	1,125
1990	12,251	1,192
1991	14,097	1,232
1992	17,843	1,467

SOURCE: EIA Marketing Services Department

U.S. SALES/SHIPMENTS

PORTABLE KEYBOARDS[1]

Table 2-11

Imports ($ Thousands)

YEAR	UNITS	DOLLARS
1983	282,000	150,000
1984	534,000	193,000
1985	1,300,500	253,285
1986	2,500,000	526,500
1987	4,798,000	548,750
1988	4,255,400	401,158
1989	3,092,000	315,937
1990	1,884,600	183,769
1991	1,720,250	273,671

[1] Includes: Imported keyboards with organ, synthesizer, or even electric piano characteristics that sell from under $100 to $1,000.
SOURCE: compiled by American Music Conference from International Association of Electronic Keyboard Manufacturers and industry estimates.

ELECTRONIC PIANOS[1]

Table 2-12

U.S. Consumption & Exports ($ Thousands)

YEAR	UNITS	DOLLARS
1983	44,000	44,000
1984	50,000	50,000
1985	60,000	107,000
1986	84,000	134,400
1987	103,100	173,208
1988	108,255	181,858
1989	114,750	206,551
1990	115,000	207,000
1991	77,125	163,500

[1] Includes: Domestic production, imports and exports of portable electronic pianos with either weighted or non-weighted keys; under 88 keys and 88 keys in either traditional or non-traditional type cabinets, and with automatic accompaniment.
SOURCE: compiled by American Music Conference from International Association of Electronic Keyboard Manufacturers and industry estimates.

ELECTRONIC MUSICAL INSTRUMENTS

Once considered an area relevant only to professional musicians and sound engineers, electronic musical instruments are now an important part of the consumer electronics arena.

The digital revolution that made its mark so heavily on audio products in the mid-to-late-eighties made an equally impressive mark on electronic musical devices, especially keyboards. With the arrival of digitally sampled sounds and MIDI (Musical Instrument Digital Interface), musicians who once relied upon several instruments to give them the needed sounds now only require one twenty pound sampling keyboard. The digital revolution not only made the use of multiple keyboards virtually unnecessary, it also brought an almost infinite selection of new sounds. For example, when one hears brass and percussion from a digital keyboard today, these are not synthesized sounds; they are actual samples of brass and drums.

The dramatic growth in sales of digital keyboards during the mid-to-late-eighties reflects the massive change-over musicians made from their analog keyboards and devices to the new and more flexible digital technology.

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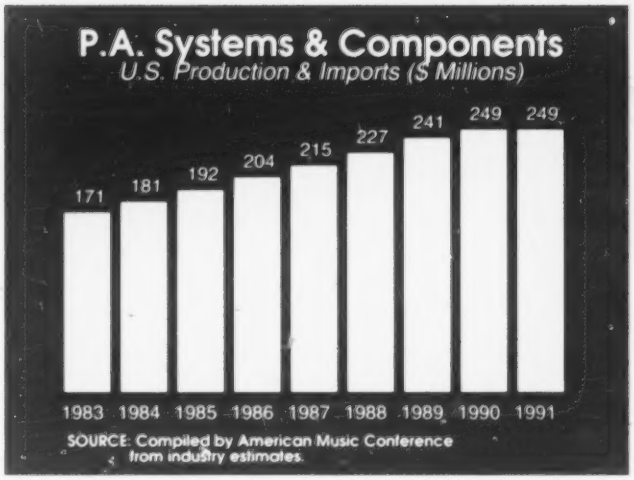
U.S. SALES/SHIPMENTS

P.A. SYSTEMS & COMPONENTS[1] Table 2-13

U.S. Production & Imports ($ Thousands)

YEAR	DOLLARS
1983	171,000
1984	181,000
1985	192,000
1986	203,900
1987	215,100
1988	227,000
1989	241,000
1990	248,500
1991	249,200

[1] Includes performance series microphones and power amplifiers, PA speaker systems and components, mixers, and signal processors.



AMPLIFIERS[1] Table 2-14

U.S. Consumption ($ Thousands)

YEAR	UNITS	DOLLARS
1983	157,000	50,000
1984	166,000	51,500
1985	170,000	51,500
1986	168,700	55,228
1987	200,300	58,250
1988	212,350	61,454
1989	233,600	66,370
1990	245,300	71,000
1991	246,500	71,900

[1] Includes: Domestic production and imports sold through music stores. Exports are not included.
SOURCE: compiled by American Music Conference from industry estimates.

SYNTHESIZERS[1] Table 2-15

U.S. Consumption & Exports ($ Thousands)

YEAR	UNITS	DOLLARS
1983	66,000	80,000
1984	134,700	136,000
1985	220,000	173,200
1986	350,500	275,000
1987	378,500	299,900
1988	361,800	303,040
1989	322,000	322,188
1990	348,000	337,900
1991	177,125	226,411

[1] Includes: Domestic production, imports and exports of keyboards, drum machines, sound modules, sequencers, sampling units/keyboards, and controller keyboards.

U.S. SALES/SHIPMENTS

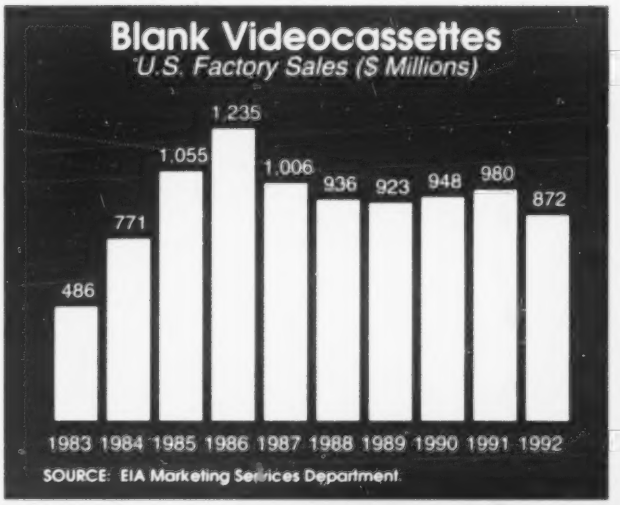
BLANK MEDIA FOR CONSUMER DISTRIBUTION

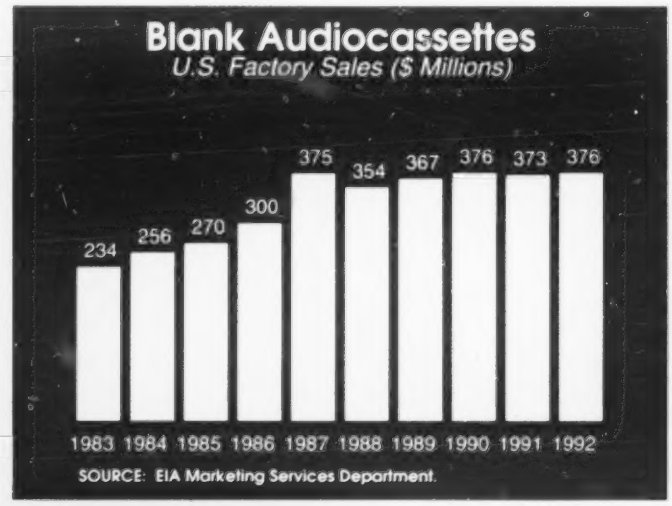
Table 2-16

U.S. Factory Sales (Millions of Units and Dollars); 1983-1992

	VIDEOCASSETTES		AUDIOCASSETTES		FLOPPY DISKS	
YEAR	UNITS	DOLLARS	UNITS	DOLLARS	UNITS	DOLLARS
1983	60	486	215	234	na	na
1984	133	771	228	256	na	na
1985	233	1,055	251	270	na	na
1986	296	1,235	304	300	na	na
1987	274	1,006	403	375	na	na
1988	297	936	378	354	365	258
1989	286	923	390	367	426	297
1990	338	948	428	376	489	314
1991	362	980	421	373	615	357
1992	358	872	426	376	640	371

Includes factory sales to distributors and factory direct sales to dealers.
Videocassette sales exclude 8mm, S-VHS, VHS-C, and S-VHS-C prior to 1988.
na - Not Available
SOURCE: EIA Marketing Services Department





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U.S. SALES/SHIPMENTS

TELEPHONES

Table 2-17

Consensus of Estimates: U.S. Sales (Thousands of Units and $ Millions): 1983-1992

Data contained in the following tables reflect a consensus of estimates provided by EIA Consumer Electronics Group Marketing Services Committee members and independent research firms. These data are not derived from regular EIA Marketing Services Department Market Activity report programs. In all cases, unit activity represents sales to dealers, while dollars sales represent total annual U.S. factory sales.

	CORDLESS PHONES		CORDED PHONES		ANSWERING DEVICES		CELLULAR PHONES	
YEAR	UNITS	DOLLARS	UNITS	DOLLARS	UNITS	DOLLARS	UNITS	DOLLARS
1983	4,700	400	15,000	525	2,200	190	n/a	n/a
1984	6,300	460	24,000	790	3,000	230	25	50
1985	4,000	280	21,000	630	4,220	325	75	115
1986	4,100	295	18,100	561	6,450	464	280	266
1987	6,400	435	15,900	461	8,800	607	300	267
1988	8,200	681	15,200	441	11,100	755	500	430
1989	10,000	830	19,000	532	12,500	838	870	653
1990	10,300	855	22,400	627	13,800	842	2,100	1,260
1991	14,500	1,233	21,400	599	14,500	928	3,100	1,070
1992	17,670	1,343	26,153	654	15,482	1,006	3,750	1,275

SOURCE: EIA Marketing Services Department

TELEPHONES & ANSWERING DEVICES

The most important recent development in telephone answering devices (TADs) has been the arrival of all-digital models. New technology that replaces audiotape with silicon chips for recording outgoing and incoming messages, makes TADs more reliable and compact. Industry observers expect the digital TAD trend to attract many first-time customers along with a large group of second-time buyers.

Another advancement in the telephone segment are the new high-tech "smart" phones. Many experts believe that smart phones are likely to become widely used for accessing a range of services and information. In several tests currently underway, smart phones let users pay bills, transfer money, perform other banking functions and shop from catalogs--without leaving the home or the home office, and all at the touch of a button.

In addition to cellular phones for cars, portable models which easily fit in a briefcase or shirt pocket continue to shrink in size and weight. According to research firm Personal Technology Research, mobile phones claimed 29% of the market in 1991, with microportables at only 10%. For 1993, PTR predicts that the tiny wonders will increase their share to 23%, with mobile phones falling to 20%.

Nineteen ninety-two saw the beginning of a conversion to digital cellular service. Digital technology will offer improved sound quality, and better security, while enabling three times as may callers to simultaneously access a cellular system.

PERSONAL COMMUNICATIONS SERVICES

Personal communications services (PCS) will allow individuals to communicate from anywhere by utilizing personal handsets or cordless telephones that would operate in a variety of pedestrian, office, residential, and vehicular settings. Using microcell technology, cells, spaced about 700 yards or less apart, the equipment will require low power levels for users to communicate with base stations. Lower power requirements, in turn, permit smaller, lighter phones that cost less to buy and operate.

According to a study by Telocator, more than 23 million people would subscribe to a PCS by 1997, and the subscriber base would grow to 56 million by 2002, but only if the FCC approves the service by 1994. PCS revenues are projected to reach $4.9 billion in 1996, predicts Frost & Sullivan, a New York market research firm.

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U.S. SALES/SHIPMENTS

HOME SECURITY SYSTEMS **Table 2-18**

Consensus Estimates; U.S. Sales ($ Millions); 1985-1992 (see note on table 2-17)

YEAR	DOLLARS
1985	600
1986	720
1987	800
1988	300
1989	1,000
1990	1,150
1991	1,250
1992	1,250

SOURCE: EIA Marketing Services Department

VEHICLE SECURITY

Today private vehicle theft reportedly costs U.S. drivers $8 billion a year in loss and damages. Once considered a "big city" phenomenon, rural and especially suburban areas are no longer immune. Results of a forecast survey by the Electronics Industries Association predicts that sales of vehicle security systems are expected to grow 15% in 1993, and average 9% gains each year over the next five years to an estimated $724 million in 1997. Active security and active/passive switchable systems have become the most popular, as a hand-held remote control clicker, which turns on the security system, puts the owner in charge.

Market analysts expect vehicle locator and navigation systems will experience significant growth in 1993 and beyond. Companies are in the process of mapping streets, restaurants, gas stations and important stores and businesses in major metro areas targeted for the program. While the expense of the system has delayed entry into many markets, systems are currently up and running in Los Angeles, New York, Detroit and Houston.

HOME SATELLITE EARTH STATIONS **Table 2-19**

Consensus Estimates; U.S. Sales (Thousands of Units and $ Millions); 1986-1992 (see note on table 2-17)

YEAR	UNITS	DOLLARS
1986	235	256
1987	250	304
1988	275	331
1989	300	365
1990	330	421
1991	310	408
1992	300	375

SOURCE: EIA Marketing Services Department

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U.S. SALES/SHIPMENTS

HOME WORKERS

As companies downsize, the newly displaced are starting their own businesses in record numbers. Those left on staff, under pressure to increase productivity and spend time with their families, are taking work home, adding fuel to the home office fire. Furthermore, an increasing number of salaried employees are "moonlighting" with home-based businesses to supplement income.

According to predictions from BIS Strategic Decisions, a leading market research firm, by 1995, 44% of all U.S. households will support some type of home office activity. Between 1991 and 1992, Link Resources reported the number of Americans who work from their homes rose to 30.4 million, up 9.4%.

Another trend boosting home office equipment sales is the expanding number of retail outlets selling these products. As manufacturers reach beyond the corporate market to the more disbursed home office and mass market, they are moving their products onto Main Street and into the mall. PCs, fax machines, cellular phones, feature phones and copiers are now readily available to consumers at electronic superstores, mass merchandisers, warehouse clubs and mail order.

FACSIMILE

The fax machine market continues its 20-year growth trend, showing an 8.8% increase in unit sales in 1992, with an estimated total of 2.1 million. Unit sales of home fax machines jumped an estimated 30% to 520 thousand units. The Computer and Business Equipment Manufacturers Association (CBEMA) expects fax sales to increase steadily, reaching 3.4 million units by 1997. Sales of plain paper machines and computer faxes, or fax modems, are on the increase. According to BIS Strategic Decisions, U.S. fax modem sales hit 2.4 million units in 1992 and could jump to 7.9 million units by 1996. The research firm attributes the growth to lower prices and increasing popularity of portable computers, estimating that one-third of portables sold in 1992 included a fax modem.

PERSONAL WORD PROCESSORS & HOME FAX MACHINES Table 2-20

Consensus Estimates; U.S. Sales (Thousands of Units and $ Millions); 1983-1992 (see note on table 2-17)

	PERSONAL WORD PROCESSORS		HOME FAX MACHINES	
YEAR	UNITS	DOLLARS	UNITS	DOLLARS
1986	2,700	580	na	na
1987	2,900	620	na	na
1988	3,100	650	na	na
1989	3,200	688	250	188
1990	3,200	656	350	219
1991	3,000	600	400	220
1992	3,000	555	520	247

Data not available before 1986.
SOURCE: EIA Marketing Services Department

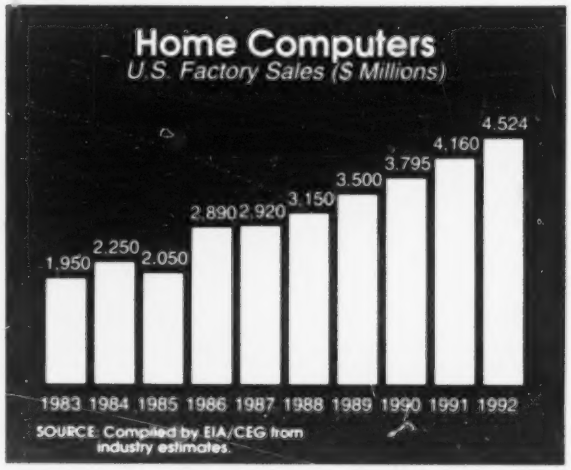
U.S. SALES/SHIPMENTS

HOME COMPUTERS Table 2-21

Consensus Estimates; U.S. Sales
(Thousands of Units and $ Millions); 1983-1992
(see note on table 2-17)

YEAR	UNITS	DOLLARS
1983	4,800	1,950
1984	5,100	2,250
1985	4,100	2,050
1986	3,800	2,890
1987	4,000	2,920
1988	4,500	3,150
1989	5,000	3,500
1990	5,500	3,795
1991	6,400	4,160
1992	7,125	4,524

SOURCE: EIA Marketing Services Department



PERSONAL ELECTRONICS

Miniaturization, joined with other breakthroughs, has spawned entirely new products that fall under the umbrella of personal electronics. With the convergence of consumer electronics, computers and communications, personal electronics is poised to become one of the fastest growing segments of consumer electronics in the 1990s and beyond. These products, often called PDAs (personal digital assistants) or PICs (personal intelligent communicators), represent what many experts consider the cutting edge of consumer technology.

These new wonders evolved from existing personal electronics products--such as electronic watches, calculators, and organizers--that continue to spawn their own new generations.

HOME COMPUTERS

The personal computer continued its move into the home market during 1992 as entirely new lines of products, specifically geared toward the home buyer, were introduced. This expansion was accompanied by intense price competition, and more features for less money. In 1991, 6.4 million computers were sold for home use, and sales reached 7.1 million in 1992, according to EIA estimates. New models equipped with powerful 486-based processors sold for well under $2,000 in 1992 -- a major factor in the strong expansion.

During 1992, computer marketers continued their aggressive expansion of mass market distribution to reach consumers. Once cloistered in computer specialty shops, computers are now sold virtually everywhere consumer electronics are found.

More user-friendly and portable systems are the focus of future development activity. The consumer market for pen-based computers, which can be used like clipboards and don't require keyboards, is expected to open up in the mid-'90s.

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ASSISTIVE DEVICES

U.S. Government statistics estimate the number of Americans with disabilities, including the elderly, to be 43 million, or 15-20% of the U.S. population. Assistive devices are designed to help individuals with disabilities and enable employers to comply with the Americans with Disabilities Act (ADA). The ADA mandates "reasonable accommodation" be made for employees or potential employees with disabilities. As the "Baby Boomer" generation continues to age, the assistive device market will also encompass some of today's products with enhanced features to meet the needs of this market segment. Products such as telephones with enlarged buttons and clearly labeled numbers will proliferate.

Personal computers, software specifically for the disabled, and other devices have helped them transition into mainstream society efficiently and effectively.

- Software translates the written word into braille or voice activated software allows a quadriplegic to use a computer, eliminating the need for key strokes
- Printers and display terminals provide a means for the blind to read braille letters either on a hard copy or on a display monitor with "raised" braille characters
- Home automation systems enable the handicapped to live more independent lives by controlling their environment via voice commands or remote controls
- Compact personal amplifiers, listening aids, and text telephones which display spoken words on a screen permit the hearing impaired to converse easily with others.
- Telephone accessories including amplifiers and add-on products such as devices which cause lights to flash when an audible ring is detected allow the hearing impaired to use conventional telephones without any modifications

ELECTRONIC INDUSTRIES FOUNDATION

Activities in education, training, and research reflect the mission of the Electronics Industries Foundation (EIF), the not-for-profit foundation of EIA, to link the electronics industry to social concerns and national needs. EIF also holds to the principle of equal educational opportunities, awarding scholarships to aid students with disabilities in pursuing technical or scientific goals.

More specifically, some of EIF's accomplishments include:

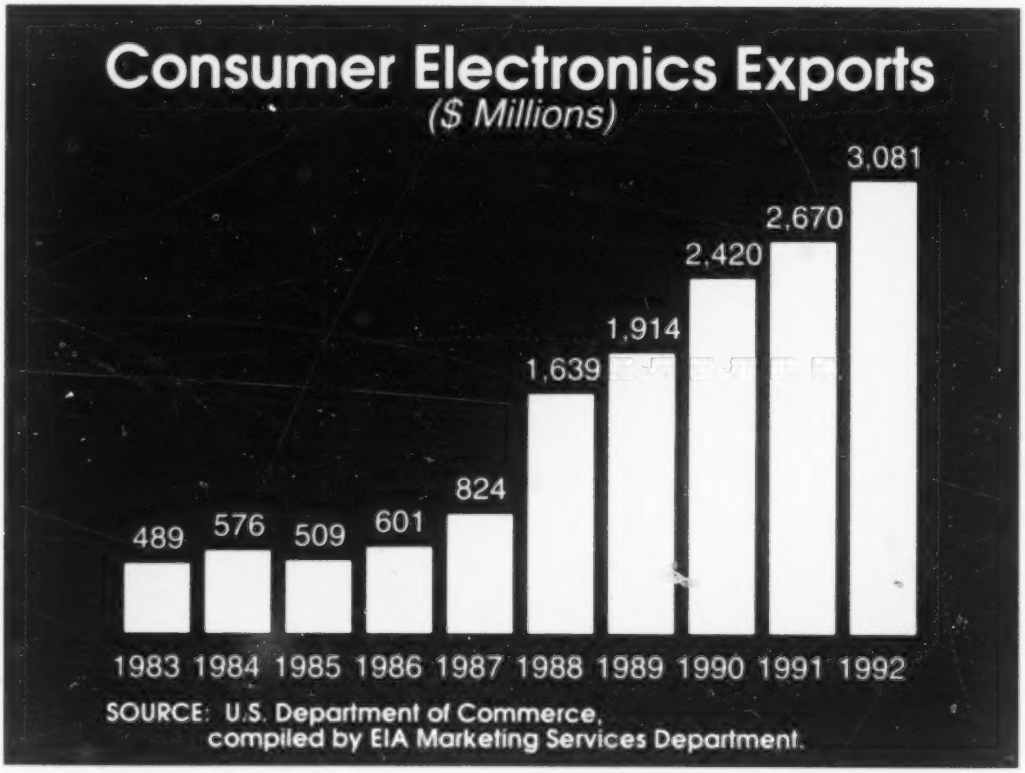
- Placing over 12,000 qualified, disabled individuals into today's competitive workplace with the assistance of EIA member companies
- Jointly developing national skill standards with EIA members, educators, and the Department of Education to ensure that those individuals entering the workforce possess the necessary talent and knowledge to perform effectively in their jobs.
- Implementing outreach programs in conjunction with federal research laboratories to expedite the commercialization of innovative technologies to bolster the United States' position in the world's technology market.

TRADE TRENDS

CONSUMER ELECTRONICS Table 2-22
U.S. ($ Millions); 1983-1992

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Imports	8,356	10,630	12,852	14,234	13,307	14,115	15,437	14,626	14,811	16,292
Exports	489	576	509	601	824	1,639	1,914	2,420	2,670	3,081
Balance of Trade	(7,867)	(10,054)	(12,343)	(13,633)	(12,483)	(12,476)	(13,523)	(12,279)	(12,130)	(13,211)

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.



CONSUMER ELECTRONICS Table 2-23
U.S. Exports ($ Millions); 1990-1992

CATEGORY	1990	1991	1992
Color TVs	363	418	523
Monochrome TVs	55	57	58
VCR Decks	166	193	204
Laserdisc Players	57	67	71
Portable Audio Equipment	74	91	98
Separate Audio Components	819	937	1,053
Home Radios	4	3	6
Home Radio/Tape Combinations	32	48	48
Autosound Equipment	253	277	292
Consumer Blank Media	411	396	419
Video Games	127	184	308
TOTAL	2,361	2,671	3,081

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

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TRADE TRENDS

CONSUMER ELECTRONICS **Table 2-24**

U.S. Imports ($ Millions); 1990-1992

CATEGORY	1990	1991	1992
Color TVs	1,659	1,603	1,997
Monochrome TVs	123	89	106
VCR Decks	2,546	2,593	3,070
Camcorders	1,703	2,044	1,495
Videocassette Players	106	127	119
Laserdisc Players	105	119	202
Portable Audio Equipment	776	1,045	1,189
Separate Audio Components	2,460	2,509	2,729
Home Radios	87	107	167
Home Radio/Tape Combinations	1,071	1,176	1,213
Autosound Equipment	1,267	1,220	1,367
Consumer Blank Media	785	878	786
Video Games	1,938	1,291	1,852
TOTAL	14,626	14,801	16,292

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

CONSUMER ELECTRONICS **Table 2-25**

U.S. Bilateral Trade ($ Thousands); 1992

IMPORTS		% of Total	EXPORTS		% of Total
Japan	7,499,922	46.0%	Canada	797,350	25.9%
Malaysia	1,663,270	10.2%	Mexico	502,643	16.3%
Mexico	1,636,038	10.0%	Japan	249,460	8.1%
S. Korea	1,607,290	9.9%	Taiwan	139,351	4.5%
China	1,186,226	7.3%	Germany	131,064	4.3%
Taiwan	681,662	4.2%	U.K.	116,259	3.8%
Singapore	671,024	4.1%	Netherlands	97,574	3.2%
Thailand	569,471	3.5%	Argentina	91,582	3.0%
Indonesia	172,157	1.1%	Venezuela	82,396	2.7%
Hong Kong	159,455	1.0%	Hong Kong	80,397	2.6%
Other	444,213	2.7%	Other	792,777	25.7%

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

ECONOMIC OVERVIEW

CONSUMER ELECTRONICS EMPLOYMENT

Table 2-26

U.S. (Thousands of Workers); 1988-1992

	1988	1989	1990	1991	1992
All Employees	62.0	65.1	62.5	61.6	60.6
Production Workers	41.6	44.7	41.5	39.7	39.1
Women Employees	28.6	30.5	29.8	27.6	28.1
Wage Index (12/88=100)	103.6	104.8	105.6	114.1	116.9

SOURCE: U.S. Department of Labor, compiled by EIA Marketing Services Department.

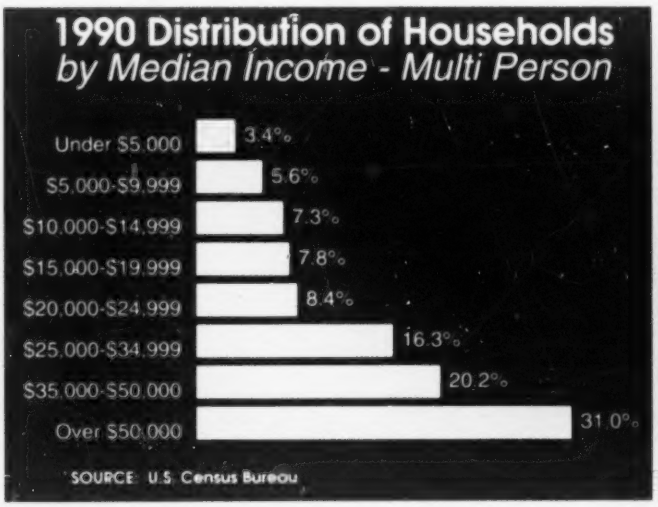
HOUSEHOLD AUDIO AND VIDEO EQUIPMENT (SIC Code 3651)

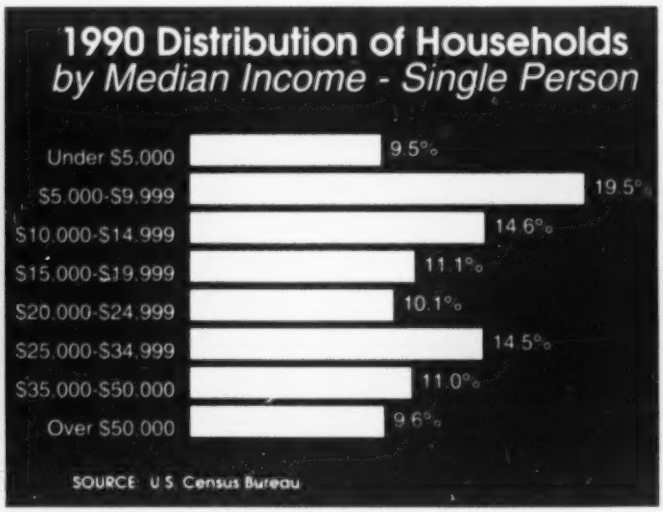
Table 2-27

U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
Indiana	16,206	26.2
California	11,361	18.4
Tennessee	6,084	9.8
Illinois	4,787	7.7
Missouri	2,129	3.4
TOTAL	61,826	100.0

Note: Additional detail on employment is available from the EIA Research Center. Please see front cover for details.
SOURCE: Employment and Wages Annual Averages,1991, U.S. Department of Labor, Bureau of Labor Statistics.





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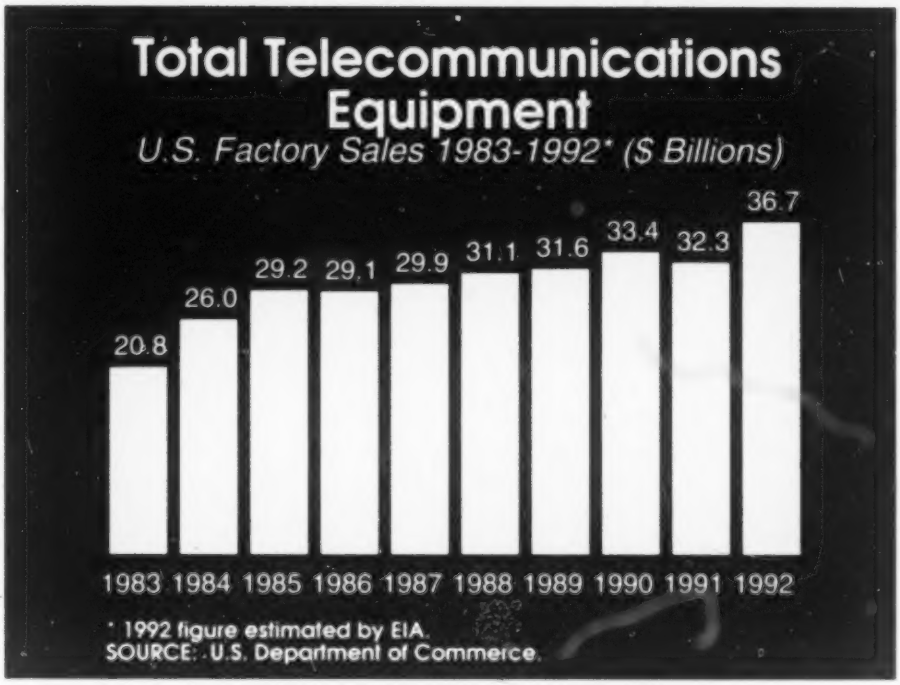
3: TELECOMMUNICATIONS & DEFENSE-RELATED COMMUNICATIONS EQUIPMENT



IN THIS CHAPTER:

- ***Telecommunications Equipment***
- ***Networks***
- ***Cellular***
- ***Fiber Optics***
- ***Microwave Systems***
- ***Space***
- ***Defense (also see Chapter 7)***

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U.S. SALES/SHIPMENTS

TELECOMMUNICATIONS EQUIPMENT Table 3-1

U. S. Factory Shipments ($ Millions); 1983-1991

	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]	1992
TELECOMMUNICATIONS EQUIPMENT										
Commercial, Industrial, and Military										
Telecommunications Equipment	7,542.1	9,157.5	10,606.2	11,124.6	11,394.7	12,212.7	14,016.3	14,724.7	14,938.8	na
Broadcast, Studio and Related Electronic Equipment	1,464.0	1,475.8	1,561.9	1,553.5	1,608.4	1,804.4	1,809.6	1,856.4	1,711.9	na
Intercommunicatons Systems	176.1	212.6	172.6	195.2	282.8	392.6	367.8	346.1	300.9	na
Telephone and Telegraph Equipment	11,594.3	14,340.9	16,126.9	15,554.1	15,995.3	16,055.2	14,743.0	15,731.3	14,611.8	na
Fiber Optic Cable	na	822.3	740.8	657.5	628.6	648.6	651.8	789.6	733.7	na
Total	20,776.5	26,009.1	29,208.4	29,084.9	29,909.8	31,113.4	31,588.6	33,448.1	32,297.1	36,740[e]

[r]- Revised
[e]- Estimated
na- Not Available
SOURCE: U.S. Department of Commerce

TELECOMMUNICATIONS OVERVIEW

Telecommunications represents one of the most dynamic and fast paced industries in the U.S. today. Factory sales of telecommunications were up 14% in 1992 to more than $36.7 billion. The telecommunications industry encompasses a wide array of products and an increasing number of services which utilize those products. U.S. employment in the production of telecommunications equipment totals about 239,000.

Factory sales of telecommunications were up 14% in 1992 to more than $36.7 billion.

Sales in the industry are nearly equally divided between telephone and telegraph equipment, and radio and television broadcast equipment. But increasingly the lines between the two are becoming blurred.

FIBER OPTICS

Fiber optics is now one of the mainstays of the telecommunications industry, with growth of 20% in 1992. Besides the continued fast pace of fiber optic cable replacement plans in the U.S., the rest of the world is discovering the benefits of fiber optics, leading to a strong export market for U.S. based manufacturers. The National Cable Television Association (NCTA) estimates that cable TV's use of fiber optics will continue to increase at a 25% annual rate through the 1990's, as investment in fiber systems may reach $18 billion.

...the rest of the world is discovering the benefits of fiber optics, leading to a strong export market for U.S. based manufacturers.

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NETWORKS

Telephone network equipment, a broad term meant to include among other things multiplexing equipment, repeaters, and switches of all kinds, is purchased primarily by publicly and privately owned network operators. Most network systems require large capital investments, and as the U.S. economy slowed during the 1991 recession spending on upgrading and retooling networks slowed. The good news for U.S. manufacturers of network equipment is that many parts of the world are in great need of major reconstruction of failing systems, particularly in Eastern Europe, Russia, South America, and China. Although the U.S. Department of Commerce estimates that spending on network systems declined slightly in 1992, they expect a rebound in 1993, as investment, delayed by the recession, is undertaken. Over the longer term the dominate trend will be the replacement of current systems with fiber optics.

The good news for U.S. manufacturers of network equipment is that many parts of the world are in great need of major reconstruction of failing systems...

COMMERCIAL, INDUSTRIAL & MILITARY TELECOMMUNICATIONS EQUIPMENT Table 3-2a

U.S. Factory Shipments ($ Millions): 1982-1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]
Fiber optics and other light systems and equipment (including infra-red)	195.1	412.3	715.6	1,013.4	945.4	726.5	717.1	772.5	892.2	1,011.6
Receivers, radio communications (except amateur and Citizens Radio)	1,290.3	1,390.6	1,678.1	1,952.7	2,001.4	1,764.2	1,761.7	1,976.5	2,153.3	2,020.8
Carrier current communications systems and equipment n.e.c.	161.2	220.0	116.8	136.5	140.4	127.1	182.7	186.6	74.8	69.6
Space satellite communications systems	1,614.4	1,759.7	2,277.4	2,281.4	2,391.7	2,224.3	2,386.7	2,465.0	2,407.8	2,267.5
Telemetering systems and equipment	192.1	304.0	246.1	358.1	376.8	378.7	323.9	221.3	206.9	207.7
Mobile radio systems	217.6	213.9	283.2	228.3	361.0	630.2	747.1	1,036.5	1,269.6	1,395.2
Mobile base stations	216.0	187.7	199.3	217.1	354.2	326.2	472.9	919.3	863.8	777.4
Mobile vehicular transmitters/ receivers	426.9	426.9	612.3	678.8	432.2	706.9	760.4	903.3	1,047.1	984.9
Portable receivers, transceivers and transmitter-receivers	510.2	535.5	716.5	648.4	778.6	926.2	1,420.2	1,447.3	2,011.1	2,135.7
Amateur and Citizens communications equipment	12.5	7.3	7.3	9.5	9.2	na	21.9	24.0	26.2	25.3
Checkout, monitoring, evaluation and other electronic support equipment for communications systems	182.6	241.7	251.8	241.4	277.1	316.3	304.0	211.1	197.7	205.1
Communications antennae, below 890 megahertz	140.6	129.1	107.8	110.6	134.1	159.8	180.6	198.7	193.4	203.8
Microwave antenna systems	147.6	145.8	161.7	168.3	209.3	254.6	278.4	312.5	341.9	325.6
Other communications equipment	1,361.5	1,567.6	1,783.6	2,561.7	2,713.2	2,853.7	2,655.1	3,341.8	3,038.9	3,308.8
TOTAL	6,668.6	7,542.1	9,157.5	10,606.2	11,124.6	11,394.7	12,212.7	14,016.4	14,724.7	14,939.0

[r] - Revised.
na - Not Available.
SOURCE: U.S. Department of Commerce.

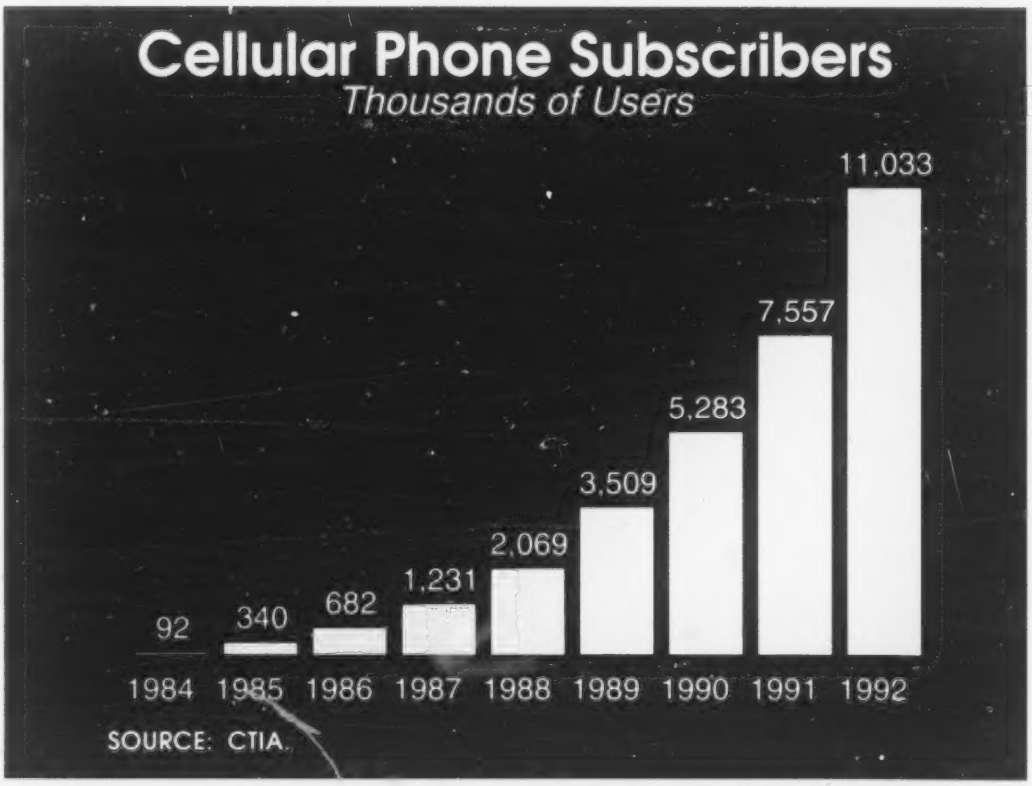
U.S. SALES/SHIPMENTS

CELLULAR

Many individuals look to cellular products as the future of the telecommunications industry. According to the Cellular Telecommunications Industry Association (CTIA), by the end of 1992 the number of cellular phone users surpassed 10 million. They also report that subscribers are buying-in at an annual rate of 30%. The year 1992 also marked an important milestone for the cellular industry when the last major service block in the United States was provided with cellular. The rapid pace of technological change has drastically shortened the product life cycle in this industry, leading to a great deal of structural change.

According to the U.S. Department of Commerce, during 1992 there were 25 primary cellular brands being sold in the U.S. market, but that many more come and go in a short period of time. However, five major brands reportedly continue to dominate U.S. cellular phone sales, estimated at $1.3 billion by EIA.

When many people look to the future of the telecommunications industry, they see cellular products.



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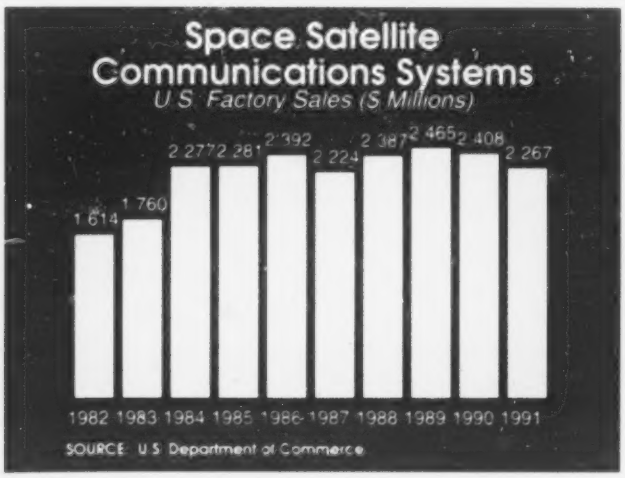
MICROWAVE SYSTEMS

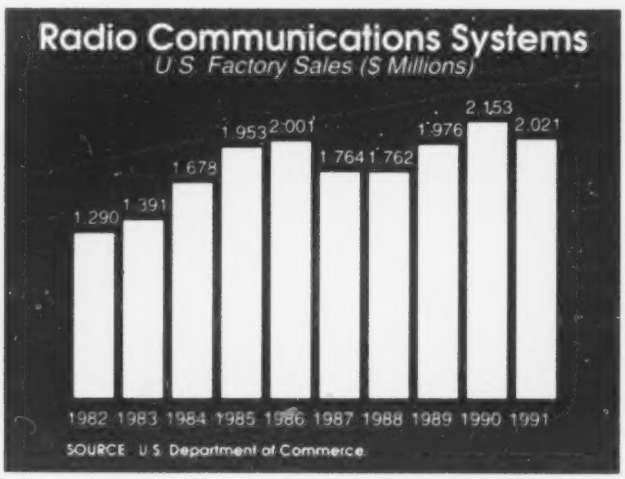
Microwave systems continue to find a wide range of applications in the telecommunications industry. Nearly all U.S. radio and over-the-air TV stations rely on some form of microwave transmission system. According to the U.S. Department of Commerce, the trend towards digital microwave systems continued in 1992. The new digital systems, broadcast in higher frequency bands, are much faster than older analog systems and can be received on smaller less expensive antenna systems. Although high frequency microwave systems hold space and cost benefits over older systems, they have the drawback of limited distance. This problem should not be a deterrent to strong growth in this segment according to the Commerce Department. They estimate annual growth of high frequency microwave equipment at 20% over the next few years. Future growth may be spurred by microwave's use in direct broadcast TV, traffic control systems and smart highways.

SPACE

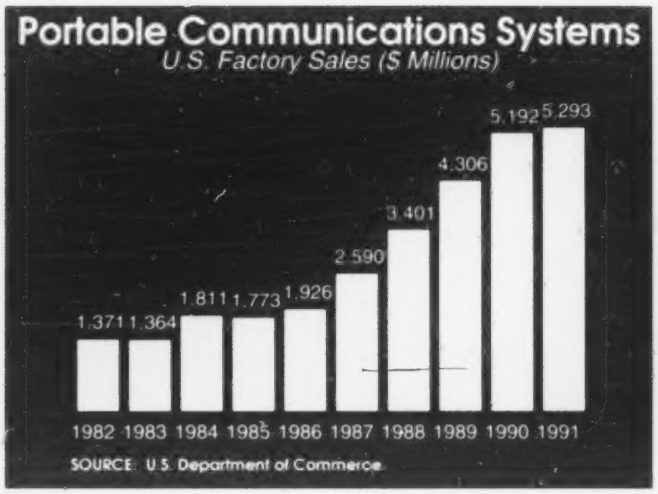
The U.S. satellite industry continued international dominance in 1992. According to the U.S. Department of Commerce, U.S. satellite manufacturers are contracted to build over 70 percent of worldwide satellite orders. Industry revenues reached $1.3 billion in 1992 from the delivery of 12 commercial satellites. The future seems bright for the U.S. satellite industry. A new cost effective low earth orbit delivery system named Pegasus, developed by Orbital Sciences, has been successfully tested. Vast cellular networks will require much more free satellite capacity than now exists and Direct Broadcast Satellite (DBS) TV has great needs of its own. (see Table 3-4).

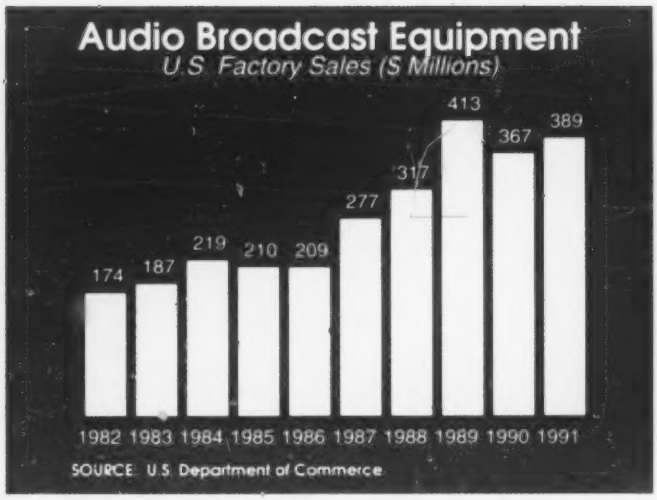
...U.S. satellite manufacturers are contracted to build over 70 percent of worldwide satellite orders.

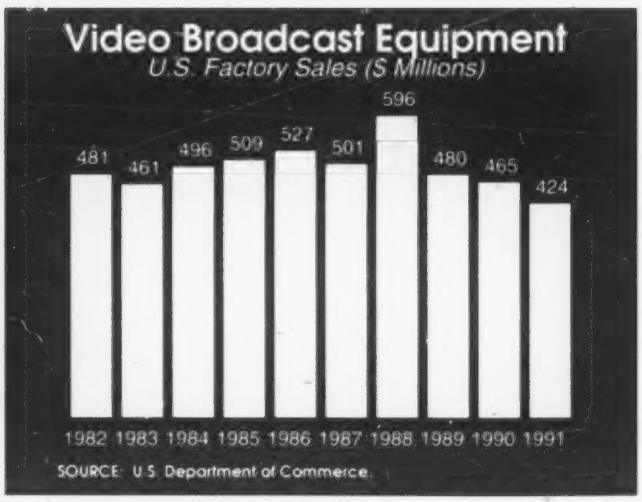




U.S. SALES/SHIPMENTS




Audio Broadcast Equipment
U.S. Factory Sales ($ Millions)
174 187 219 210 209 277 317 413 367 389
1982 1983 1984 1985 1986 1987 1988 1989 1990 1991
SOURCE: U.S. Department of Commerce


Video Broadcast Equipment
U.S. Factory Sales ($ Millions)
481 461 496 509 527 501 596 480 465 424
1982 1983 1984 1985 1986 1987 1988 1989 1990 1991
SOURCE: U.S. Department of Commerce

(see Table 3-2b)

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U.S. SALES/SHIPMENTS

OTHER TELECOMMUNICATIONS EQUIPMENT

Table 3-2b

U.S. Factory Shipments ($ Millions); 1982-1991

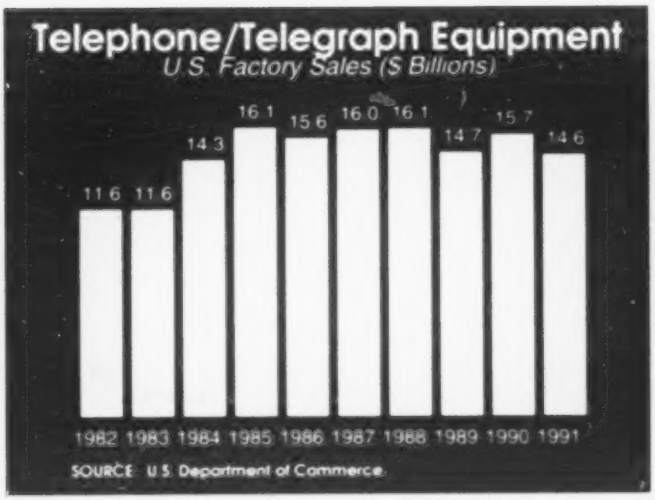
	1982	1983	1984	1985	1986	1987	1988	1989	1990r	1991r
BROADCAST, STUDIO AND RELATED ELECTRONIC EQUIPMENT										
Audio equipment	174.0	186.5	219.3	209.8	209.4	276.6	316.8	412.6	367.2	388.5
Video equipment	480.9	461.2	496.2	509.3	527.0	501.3	595.5	479.9	465.5	423.5
Transmitters, RF power amplifiers and related equipment	127.1	111.4	107.3	135.1	122.2	124.4	128.1	104.5	123.5	111.4
Studio transmitter links (STL) and remote pickup equipment	18.6	41.5	7.9	18.8	17.4	16.6	43.4	20.8	25.0	24.7
Cable TV equipment	459.4	452.5	410.4	375.2	382.7	327.0	423.5	540.6	554.0	422.2
Closed circuit TV equipment	123.3	99.2	109.3	125.2	141.1	95.8	135.3	144.8	165.3	181.7
Broadcasting transmitting antennae and community antennae	74.6	49.1	38.2	94.7	60.3	50.0	45.2	11.4	18.9	22.4
Other communications equipment (broadcast, studio, theater and commercial sound equipment)	85.9	62.6	87.2	93.8	93.4	216.7	116.6	95.1	137.0	137.3
INTERCOMMUNICATIONS SYSTEMS										
Intercommunications equipment electronically amplified	324.6	176.1	212.6	172.6	195.2	282.8	392.6	367.8	346.1	300.9
TELEPHONE AND TELEGRAPH EQUIPMENT										
Private branch exchange equipment	1,047.8	1,050.1	1,603.7	1,720.8	855.9	1,412.3	1,011.2	909.3	1,273.1	1,200.9
Central office switching equipment	1,958.9	2,218.5	2,856.9	4,332.8	4,472.3	4,550.4	4,925.4	4,439.2	4,635.4	3,972.6
Other switching and switchboard equipment	1,441.1	1,382.1	1,410.6	1,660.7	1,851.9	1,404.5	1,463.1	1,627.0	1,628.6	2,274.2
Carrier line equipment	1,563.4	1,488.5	1,917.3	2,329.5	2,833.0	3,720.3	4,342.5	3,590.4	3,728.9	3,135.9
Telephone sets	1,064.9	831.2	846.7	1,218.6	790.6	299.9	346.0	345.7	224.2	158.3
Teleprinters	334.0	387.2	294.1	270.8	361.2	na	na	na	na	na
Modems	655.6	791.2	848.3	829.5	1,229.2	1,291.4	1,246.5	1,115.4	1,284.8	1,155.5
Voice frequency equipment	213.5	227.9	301.7	328.3	243.0	175.0	155.5	90.2	136.7	113.2
Answering devices	na	na	na	na	na	96.1	36.7	33.9	30.9	25.3
Key systems	na	na	na	na	na	622.0	422.3	344.0	313.5	295.9
Facsimile equipment	185.5	151.7	100.2	64.4	59.5	108.6	202.0	195.6	196.6	191.7
Other telephone and telegraph equipment and parts	3,148.4	3,065.9	4,161.4	3,371.5	2,857.5	2,314.8	1,904.0	2,052.4	2,278.6	2,088.3
FIBER OPTIC AND COAXIAL CABLE										
Insulated optical fiber cable	na	na	822.3	740.8	657.5	628.6	648.6	651.8	789.6	733.7
Total	13,481.5	13,234.4	16,851.6	18,602.2	17,960.3	18,515.1	18,900.7	16,572.2	18,723.4	17,358.1

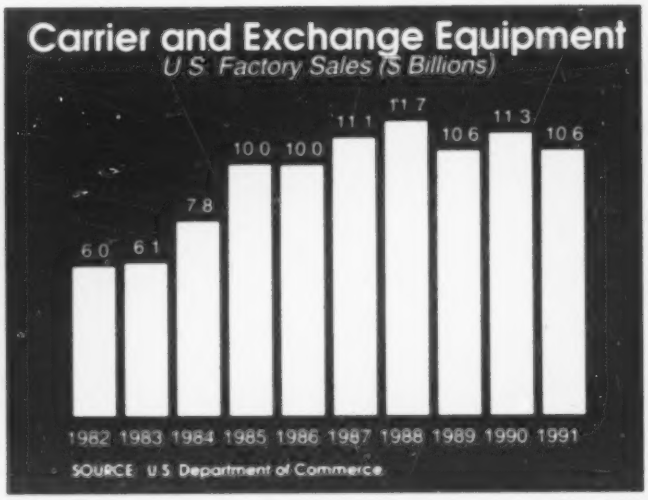
r- Revised.
na - Not Available.
SOURCE: U.S. Department of Commerce.

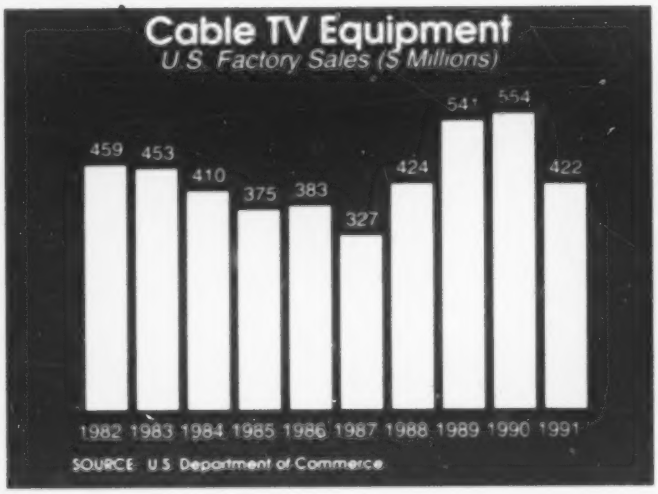
CUSTOMER PREMISES EQUIPMENT

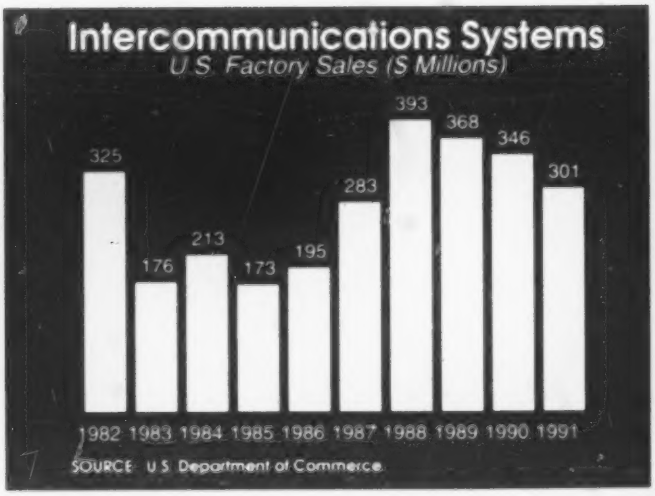
Current network systems, which were designed predominantly to handle voice communications, are now being taxed by "Customer Premises Equipment." New additions to this family of products are fax machines, the increased use of computer modems, voice-mail systems, and even touch-tone help lines offered as a service by many businesses. The Department of Commerce estimates that shipments of these new technologies grew sharply in 1992. Specifically, shipments of interactive voice response systems and voice-mail systems grew 39% and 14%, respectively, over 1991. A strong factor in the increased popularity of these systems is that they lead to greater efficiency and worker productivity, which leads to lower costs.

U.S. SALES/SHIPMENTS









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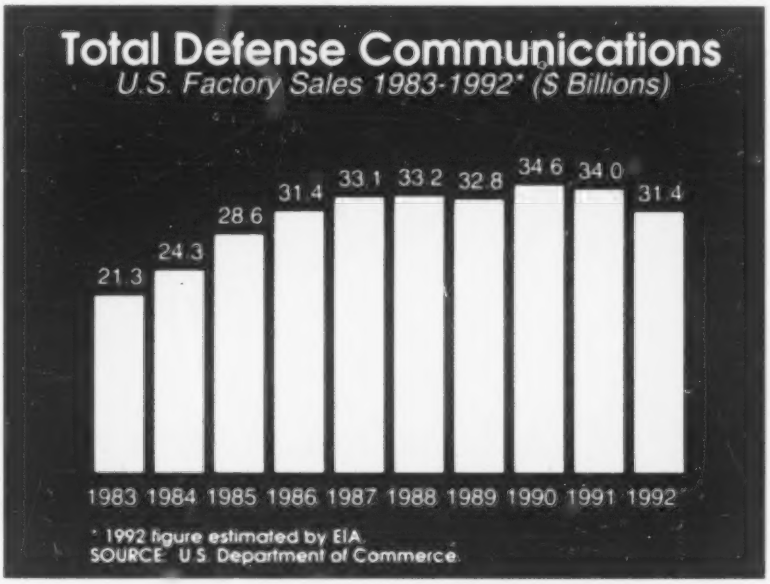
U.S. SALES/SHIPMENTS

DEFENSE RELATED & OTHER COMMUNICATIONS EQUIPMENT Table 3-3

U.S. Factory Shipments ($ Millions); 1983-1992

	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]	1992
OTHER COMMUNICATIONS EQUIPMENT										
Search and Detection, Navigation and Guidance Systems and Equipment	19,981.7	22,822.6	27,057.0	29,921.1	31,425.6	31,689.0	31,258.4	33,073.9	32,509.2	na
Alarm and Traffic Control Systems	1,360.6	1,519.4	1,570.0	1,474.4	1,661.4	1,551.7	1,583.6	1,497.8	1,531.8	na
TOTAL	21,342.3	24,342.0	28,627.0	31,395.5	33,087.0	33,240.7	32,842.0	34,571.7	34,041.0	31,357[e]

[r]- Revised
[e]-Estimated
SOURCE: U.S. Department of Commerce



DEFENSE

U.S. factory sales of specialized defense communications equipment fell roughly 8% in 1992, dropping to $31.4 billion. This industry manufactures products primarily used by the military, including missile guidance systems, sonar, radar, and air-traffic control systems. The industry employed 239,000 workers, on average, in 1992, down 10% from the prior year.

The 1992 decline marked the second consecutive year factory sales fell, after robust growth during the defense build-up of the 1980's. The collapse of the Soviet Union has led to a major reevaluation of radar and early warning needs according to the U.S. Department of Commerce. Since non-military domestic demand is a small part of the industry, manufacturers are looking overseas to help ease the transition to more commercial sales.

Surveillance and tracking systems recorded sales of $2.7 billion in 1991, while radar systems posted sales of $6.8 billion, a slight decline from $6.9 billion in 1990. Sonar surveillance systems were virtually unchanged with dollar volume just under $2.4 billion.

U.S. SALES/SHIPMENTS

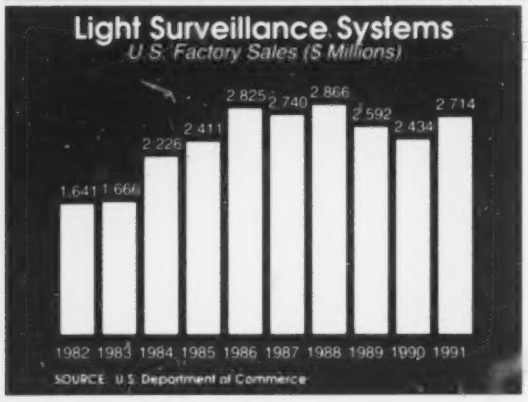
DEFENSE RELATED & OTHER COMMUNICATIONS EQUIPMENT

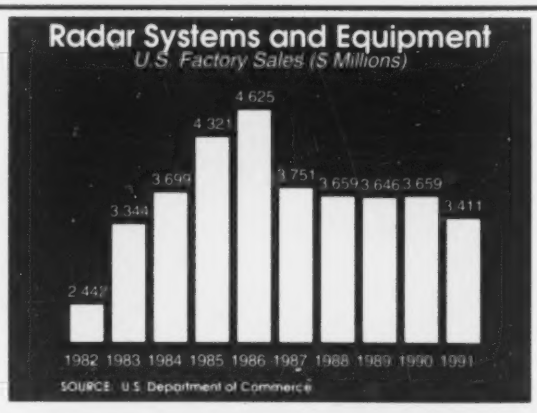
Table 3-4

U.S. Factory Shipments ($ Millions); 1982-1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]
SEARCH & DETECTION, NAVIGATION & GUIDANCE SYSTEMS & EQUIPMENT										
Light reconnaissance and surveillance systems and equipment	1,641.1	1,666.3	2,225.6	2,410.5	2,824.7	2,739.9	2,865.9	2,592.1	2,434.0	2,713.8
IFF equipment	94.0	151.5	174.0	156.3	155.5	226.8	287.7	288.8	223.1	176.9
Proximity fuses	154.4	209.9	259.6	196.9	281.3	234.6	300.6	359.9	369.7	314.5
Radar systems and equipment	2,441.5	3,344.3	3,698.8	4,321.0	4,625.3	3,751.4	3,658.8	3,645.8	3,658.8	3,411.3
Tracking radar	1,779.1	2,088.4	1,820.5	2,207.5	2,452.2	2,900.4	2,915.6	3,312.6	3,321.7	3,413.2
Instrumentation radar	101.4	74.1	200.6	226.3	185.4	201.9	221.4	147.1	223.5	168.2
Checkout, monitoring, evaluation and other support equipment for radar systems	267.0	329.2	435.0	474.4	445.9	479.9	453.6	331.0	458.1	520.5
Sonar search, detection and tracking systems and equipment	1,155.5	1,374.2	1,620.0	1,885.3	1,933.8	1,835.0	1,735.6	1,801.9	2,459.9	2,356.8
Checkout, monitoring, evaluation, etc. for sonar	259.7	287.8	250.6	333.9	402.0	310.9	251.7	199.6	270.5	296.0
Specialized command and control data processing and display equipment sold separately from complete systems	399.5	536.7	921.4	977.0	1,127.9	1,505.9	1,519.0	1,269.3	1,283.7	1,429.9
Meteorological electronics equipment and radio astronomy equipment	67.6	78.7	85.7	127.5	213.2	292.5	361.6	218.0	282.5	357.6
Geophysical electronic equipment	351.6	228.5	316.4	311.1	204.2	222.1	181.6	194.2	371.3	389.1
Search, detection, identification and tracking systems, n.e.c.	1,047.8	1,189.4	1,510.0	1,961.1	1,953.4	1,964.0	1,784.0	1,799.4	1,612.6	1,677.7
Missiles-borne and space-vehicle-borne equipment	1,867.2	1,855.9	2,204.9	2,731.9	3,410.3	4,169.4	4,452.9	4,317.1	4,656.3	4,535.2
Non-missile and space vehicle guidance	394.6	420.2	480.2	508.3	536.5	540.7	482.7	736.7	742.3	597.2
Checkout, launching and other missile and space vehicle support systems	392.5	490.1	468.5	765.1	705.6	654.5	629.4	443.1	504.1	567.3
Counter measures equipment (includes jamming and underwater equipment)	1,283.5	1,595.8	2,036.5	2,682.1	3,089.6	3,527.1	3,314.7	2,838.2	2,057.7	1,652.6
Specialized electronic and communication intelligence equipment	1,345.9	1,349.1	1,370.2	1,809.5	1,895.4	2,049.1	2,271.7	2,197.9	2,475.6	2,483.9
Navigation systems and equipment for aircraft, ship and ground navigation (autopilots, beacons, collision warning devices, direction finders, etc.)	2,689.1	2,711.6	2,744.1	2,971.3	3,478.9	3,819.5	4,000.5	4,565.7	5,668.6	5,447.7
ALARM AND TRAFFIC CONTROL SYSTEMS										
Alarm systems (includes intrusion and fire detection equipment)	866.2	879.6	1,045.2	1,114.3	1,028.2	1,235.0	1,164.7	1,132.5	1,027.2	1,055.1
Traffic control equipment (vehicular and pedestrian, railway signals and attachments)	413.1	481.0	474.2	455.7	446.2	426.4	387.0	451.1	470.6	476.7
Total	19,012.3	21,342.3	24,342.0	28,627.0	31,395.5	33,087.0	33,240.7	32,842.0	34,571.7	34,041.0

r- Revised.
SOURCE: U.S. Department of Commerce.





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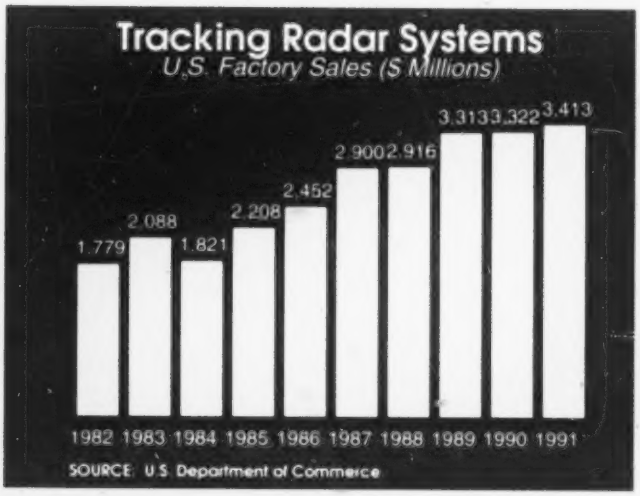
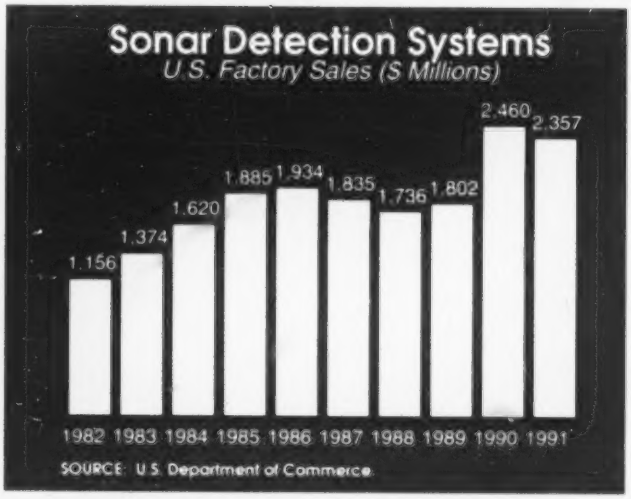
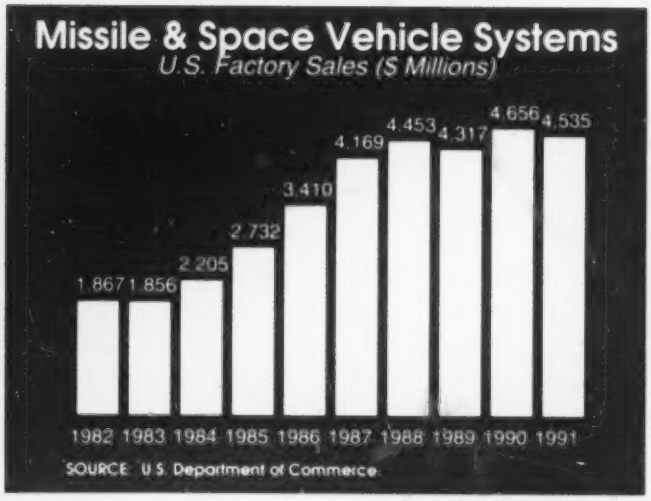
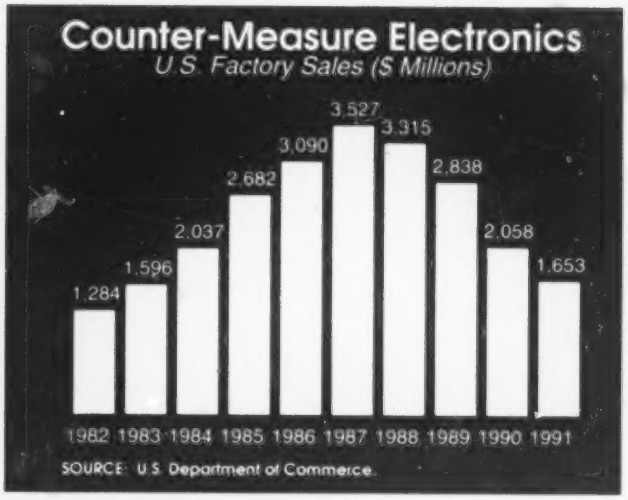
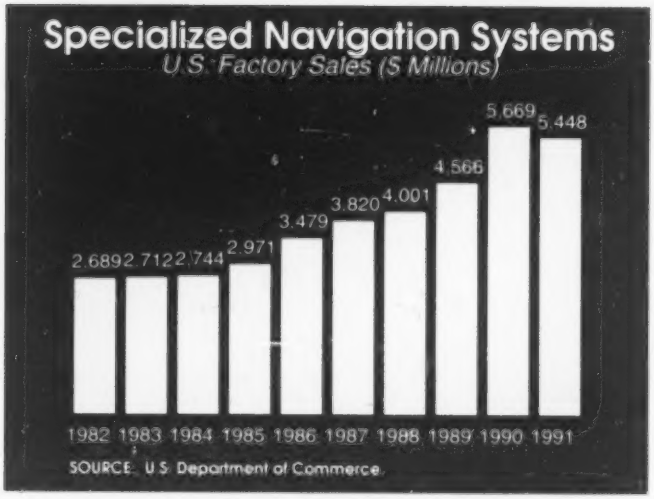
U.S. SALES/SHIPMENTS











TRADE TRENDS

TELECOMMUNICATIONS TRADE

The telecommunications industry recorded a second consecutive trade surplus in 1992, helped by exports of satellites and related equipment. U.S. exports increased 15% to $8.5 billion, while imports climbed 14% to $8.3 billion. The two largest markets for U.S. produced telecommunications were Canada and Mexico. U.S. exports of cellular phones showed substantial growth during the year. Total export volume of cellular phones rose from $572 million in 1991 to $768 million in 1992.

TELECOMMUNICATIONS EQUIPMENT **Table 3-5**
U.S. Imports & Exports ($ Millions), 1990-1992

	1990	1991	1992
Imports	7,492	7,276	8,279
Exports	6,932	7,331	8,453
Balance of Trade	(560)	55	174

Data prior to 1990 included in Total Communications Equipment
SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

TELECOMMUNICATIONS EQUIPMENT **Table 3-6**
U.S. Exports (Millions of Dollars), 1990-1992

CATEGORY	1990	1991	1992
Telephone Sets and Parts	199	203	233
Telephonic Apparatus and Parts	1,446	1,501	1,889
Telegraphic Apparatus and Parts	446	574	813
Radio Transmitters	312	333	330
Radio Receivers	287	211	247
Radio Transceivers	640	800	962
Telephone Answering Devices	92	112	139
TV Transmission/Reception Apparatus	2,274	2,129	2,025
Cellular Telephones	462	572	768
Facsimile Machines			
Cordless Telephones	77	90	133
Modems	328	331	385
Paging Alert Devices	2	2	1
Fiber Optic Cable	121	168	167
Other Cable and Parts	227	270	359
TOTAL	6,932	7,331	8,453

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

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TRADE TRENDS

TELECOMMUNICATIONS EQUIPMENT
U.S. Imports (Millions of Dollars), 1990-1992

Table 3-7

CATEGORY	1990	1991	1992
Telephone Sets and Parts	1,044	958	1,054
Telephonic Apparatus and Parts	947	1,011	1,217
Telegraphic Apparatus and Parts	338	441	530
Radio Transmitters	71	66	63
Radio Receivers	185	171	215
Radio Transceivers	582	575	619
Telephone Answering Devices	313	296	308
TV Transmission/Reception Apparatus	1,925	1,359	1,552
Cellular Telephones	359	283	410
Facsimile Machines	777	908	968
Cordless Telephones	588	806	954
Modems	119	145	158
Paging Alert Devices	59	7	4
Fiber Optic Cable	24	27	61
Other Cable and Parts	161	155	165
TOTAL	7,492	7,276	8,279

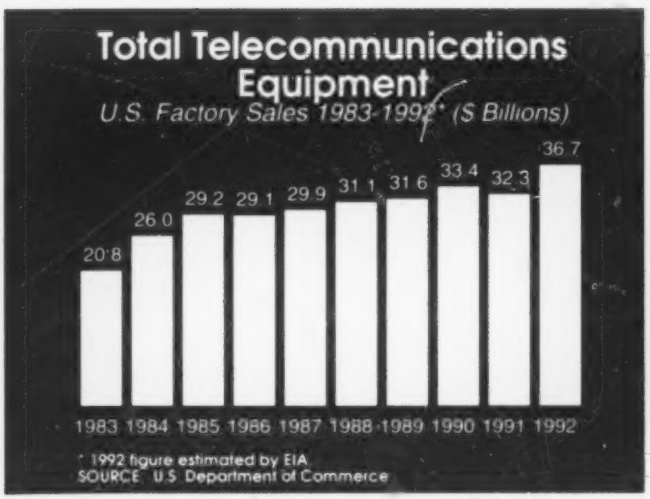
SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

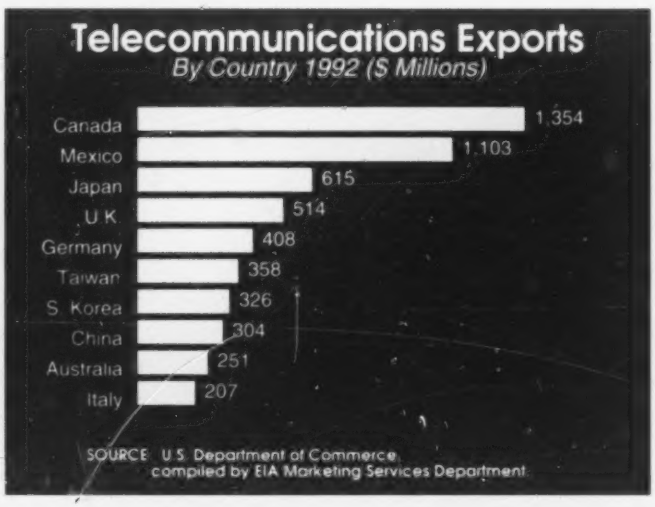
TELECOMMUNICATIONS EQUIPMENT
U.S. Bilateral Trade (Thousands of Dollars), 1992

Table 3-8

IMPORTS		% of Total	EXPORTS		% of Total
Japan	2,920,022	35.3%	Canada	1,354,463	16.0%
Canada	995,716	12.0%	Mexico	1,103,301	13.1%
Malaysia	637,824	7.7%	Japan	614,714	7.3%
Taiwan	582,332	7.0%	U.K.	514,049	6.1%
China	576,463	7.0%	Germany	408,388	4.8%
Mexico	409,657	4.9%	Taiwan	357,941	4.2%
S. Korea	349,658	4.2%	S. Korea	326,468	3.9%
Thailand	296,639	3.6%	China	303,988	3.6%
Singapore	265,890	3.2%	Australia	251,471	3.0%
Israel	254,137	3.1%	Italy	206,666	2.4%
Other	989,425	12.0%	Other	3,010,352	35.6%
TOTAL	8,277,763	100.0%	TOTAL	8,451,801	100.0%

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.





TRADE TRENDS

DEFENSE COMMUNICATIONS EQUIPMENT Table 3-9
U.S. Imports & Exports ($ Millions), 1990-1992

	1990	1991	1992
Imports	919	1,030	1,120
Exports	2,473	2,584	2,496
Balance of Trade	1,554	1,554	1,376

Data prior to 1990 included in Total Communications Equipment
SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

DEFENSE COMMUNICATIONS EQUIPMENT Table 3-10
U.S. Imports ($ Millions), 1990-1992

CATEGORY	1990	1991	1992
Smoke Detectors and Other Alarms	159	198	267
Sound/Sight Signaling Apparatus	14	16	15
Radar/Radio Navigational Equipment	721	799	818
Meteorological/Geophysical Instruments	25	9	11
TOTAL	919	1,030	1,112

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

DEFENSE COMMUNICATIONS EQUIPMENT Table 3-11
U.S. Exports ($ Millions), 1990-1992

CATEGORY	1990	1991	1992
Smoke Detectors and Other Alarms	134	156	178
Sound/Sight Signaling Apparatus	49	51	66
Radar/Radio Navigational Equipment	2,271	2,359	2,231
Meteorological/Geophysical Instruments	18	19	21
TOTAL	2,473	2,584	2,496

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

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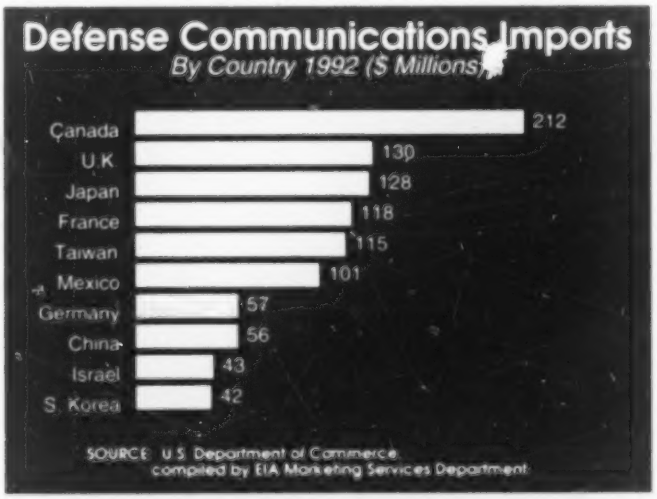
TRADE TRENDS

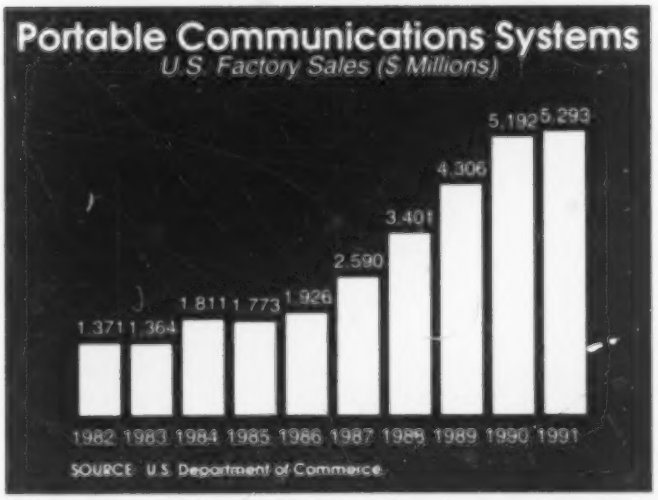
DEFENSE COMMUNICATIONS EQUIPMENT
U.S. Bilateral Trade (Thousands of Dollars), 1992

Table 3-12

IMPORTS		% of Total	EXPORTS		% of Total
Canada	212,180	19.1%	Japan	307,122	12.3%
U.K.	130,052	11.7%	Canada	266,008	10.7%
Japan	128,108	11.5%	U.K.	198,253	7.9%
France	118,443	10.7%	France	186,158	7.5%
Taiwan	115,148	10.4%	Netherlands	154,726	6.2%
Mexico	100,979	9.1%	Taiwan	127,953	5.1%
Germany	56,555	5.1%	Egypt	125,769	5.0%
China	56,473	5.1%	Germany	102,091	4.1%
Israel	43,321	3.9%	Israel	97,678	3.9%
S. Korea	42,044	3.8%	S. Korea	72,739	2.9%
Other	108,471	9.8%	Other	857,702	34.4%
TOTAL	1,111,774	100.0%	TOTAL	2,496,199	100.0%

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.





TELECOMMUNICATIONS INDUSTRY

Table 3-14

Historical Macroeconomic Data ($ Millions), United States, 1990-1992

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
FACTORY SALES													
1990	2,228	2,832	2,850	2,701	2,688	2,968	2,432	2,731	3,062	2,778	2,765	3,412	33,448
1991	2,244	2,529	2,761	2,431	2,672	2,917	2,287	2,569	3,076	2,536	2,832	3,443	32,297
1992	2,398	2,734	3,132	2,636	2,786	3,249	2,879	2,831	3,743	3,052	3,098	4,201	36,740
NEW ORDERS													
1990	2,195	2,717	2,748	2,593	2,638	3,551	2,369	2,674	2,935	2,854	2,382	4,211	33,868
1991	1,958	2,796	2,422	2,316	2,347	2,821	2,173	2,231	2,960	2,529	2,590	3,634	30,779
1992	2,392	2,630	3,304	2,447	2,812	3,328	2,986	2,757	3,816	3,182	2,960	4,315	36,931
INVENTORY													
1990	6,811	6,861	6,768	6,828	6,853	6,788	6,892	7,047	7,035	7,030	7,058	6,718	6,891
1991	6,616	6,682	6,815	7,008	6,927	6,708	6,834	6,715	6,542	6,609	6,601	6,614	6,723
1992	6,743	6,673	6,592	6,724	6,816	6,777	6,758	6,923	6,756	6,671	6,827	6,916	6,765

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
IMPORTS													
1990	575	516	660	606	549	618	651	675	646	737	661	598	7,492
1991	556	554	592	594	530	613	627	595	627	657	663	669	7,276
1992	602	601	699	635	608	723	679	689	744	786	737	775	8,279
EXPORTS													
1990	434	533	676	507	508	711	693	622	565	626	536	521	6,932
1991	627	471	682	543	702	618	603	592	605	585	619	684	7,331
1992	644	574	712	609	673	726	684	609	754	1,009	709	750	8,453

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Avg.
FINISHED EQUIPMENT FACTORY PRICE INDEX (12/90=100)													
1990	100.7	100.8	100.8	99.8	99.9	100.3	100.3	100.0	99.9	100.1	100.1	100.1	100.2
1991	100.9	100.9	101.1	101.5	101.6	101.5	102.2	102.2	102.4	102.6	102.6	102.5	101.8
1992	102.7	102.6	103.1	103.1	103.3	103.3	103.3	103.5	103.4	103.4	103.5	103.7	103.3

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Avg.
EIA TELECOMMUNICATIONS STOCK INDEX (1/91=100)													
1991	100.00	106.98	112.12	114.24	118.80	112.70	114.90	116.69	114.33	116.69	110.98	119.26	113.14
1992	124.64	128.16	120.81	119.10	112.68	108.85	110.94	115.88	117.45	118.04	120.33	123.55	118.37

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Deparment.

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ECONOMIC OVERVIEW

TELECOMMUNICATIONS EQUIPMENT Table 3-15

U.S. Employment (Thousands of Workers): 1988-1992

	1988	1989	1990	1991	1992
All Employees	275.6	272.2	264.1	252.1	238.7
Production Workers	138.2	136.8	132.6	126.7	121.6
Women Employees	112.7	111.3	108.0	103.0	97.6
Wage Index (12/88=100)	101.0	104.6	104.1	107.2	108.6

SOURCE: U.S. Department of Labor, compiled by EIA Marketing Services Department.

ECONOMIC OVERVIEW

TELEPHONE AND TELEGRAPH APPARATUS (SIC Code 3661)

Table 3-16

U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
Texas	15,140	13.2
Massachusetts	13,761	12.0
California	12,521	10.9
North Carolina	11,613	10.1
Illinois	10,721	9.3
TOTAL	114,760	100.0

Note: Additional detail on employment is available from the EIA Research Center. Please see front inside cover for details.

SOURCE: *Employment and Wages Annual Averages, 1991*, U.S. Department of Labor, Bureau of Labor Statistics.

RADIO AND TV COMMUNICATIONS EQUIPMENT (SIC Code 3663)

Table 3-17

U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
California	11,570	10.5
New Jersey	11,308	10.3
Florida	10,441	9.5
Texas	9,386	8.5
Virginia	9,055	8.2
TOTAL	110,003	100.0

SOURCE: *Employment and Wages Annual Averages, 1991*, U.S. Department of Labor, Bureau of Labor Statistics.

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OTHER DEFENSE COMMUNICATIONS

Table 3-18

U.S. Historical Macroeconomic Data ($ Millions), 1990-1992

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
FACTORY SALES													
1990	2,286	2,669	2,991	2,600	2,879	2,984	2,595	2,779	3,150	2,843	3,090	3,705	34,572
1991	2,241	2,525	3,134	2,621	2,797	3,105	2,357	3,099	2,924	2,848	3,141	3,249	34,041
1992	2,129	2,573	2,924	2,458	2,550	2,877	2,201	2,464	2,888	2,468	2,760	3,065	31,357
NEW ORDERS													
1990	2,319	2,283	2,924	2,714	2,939	2,964	2,356	2,135	2,899	2,687	2,549	3,261	32,029
1991	1,681	2,994	1,980	1,790	2,800	2,844	2,806	2,966	2,672	2,860	2,292	2,761	30,445
1992	2,687	2,397	2,779	1,251	2,079	1,864	2,008	1,609	2,949	1,975	2,930	4,234	28,761
INVENTORY													
1990	8,764	9,018	8,964	9,152	9,220	9,053	9,123	9,094	8,883	8,972	8,806	8,175	8,935
1991	8,394	8,668	8,318	8,523	8,414	8,328	8,411	8,464	8,181	8,176	7,911	7,680	8,289
1992	7,572	7,560	7,488	7,458	7,401	7,257	7,348	7,269	6,991	6,816	6,631	6,347	7,178

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
IMPORTS													
1990	72	69	87	72	77	76	89	73	75	78	76	75	919
1991	84	68	84	101	89	76	98	89	80	95	92	74	1,030
1992	82	91	93	98	79	103	93	91	91	115	89	95	1,120
EXPORTS													
1990	206	164	248	217	207	191	193	213	202	199	222	211	2,473
1991	234	178	230	207	220	207	224	184	227	223	213	238	2,584
1992	194	212	211	197	216	192	260	186	194	244	188	203	2,496

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Avg.
FINISHED EQUIPMENT FACTORY PRICE INDEX (12/90=100)													
1990	97.9	97.9	97.9	98.6	98.9	99.1	99.3	99.5	100.0	100.0	100.1	100.0	99.1
1991	99.9	99.9	100.2	100.1	99.8	99.7	99.8	99.8	99.8	99.8	100.4	100.4	100.0
1992	100.3	100.3	100.2	98.5	98.8	98.8	98.6	98.8	98.8	99.4	99.1	99.2	99.2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Avg.
EIA DEFENSE/AEROSPACE STOCK INDEX (1/91=100)													
1991	100.00	101.00	107.39	107.58	115.34	111.54	118.51	116.23	113.91	117.60	111.85	120.18	111.76
1992	120.02	124.32	114.67	117.34	113.12	112.20	115.69	119.99	119.20	122.77	122.76	130.66	119.40

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

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ECONOMIC OVERVIEW

OTHER DEFENSE COMMUNICATIONS EQUIPMENT

Table 3-19

U.S. Employment (Thousands of Workers); 1988-1992

	1988	1989	1990	1991	1992
All Employees	316.1	299.7	284.5	263.6	238.5
Production Workers	105.9	100.7	94.0	83.9	75.3
Women Employees	109.9	104.2	98.9	91.6	82.9
Wage Index (12/88=100)	101.9	105.0	111.6	115.7	119.5

SOURCE: U.S. Department of Labor, compiled by EIA Marketing Services Department.

COMMUNICATIONS EQUIPMENT, NEC (SIC Code 3669)

Table 3-20

U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
New York	4,326	18.1
California	3,794	15.9
Massachusetts	1,985	8.3
Florida	1,938	8.1
Texas	1,668	7.0
TOTAL	23,922	100.0

NEC - Not elsewhere classified.
SOURCE: *Employment and Wages Annual Averages, 1991*, U.S. Department of Labor, Bureau of Labor Statistics.

SEARCH AND NAVIGATION EQUIPMENT (SIC Code 3812)

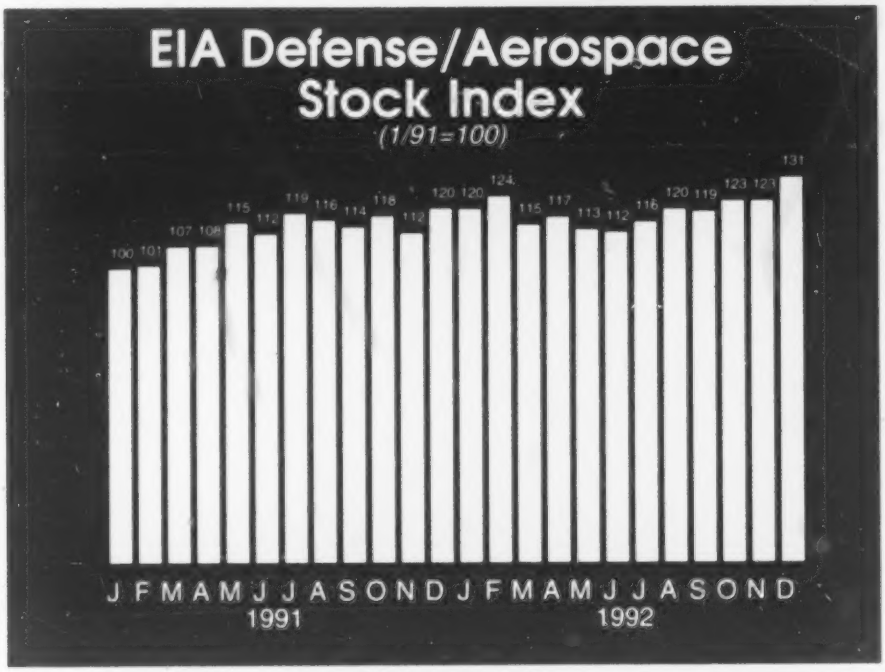
Table 3-21

U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
California	94,864	36.5
New York	25,850	9.9
Maryland	15,834	6.1
Massachusetts	15,387	5.9
Florida	12,778	4.9
TOTAL	260,010	100.0

SOURCE: *Employment and Wages Annual Averages, 1991*, U.S. Department of Labor, Bureau of Labor Statistics.

ECONOMIC OVERVIEW



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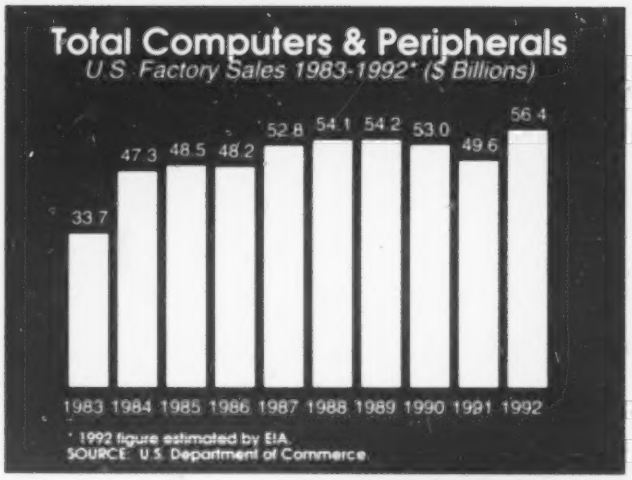
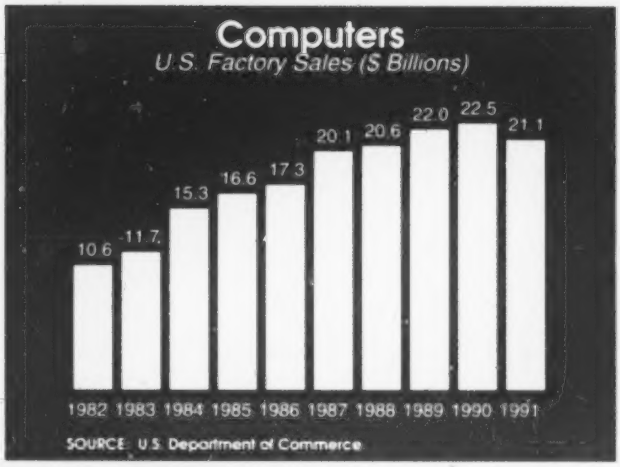
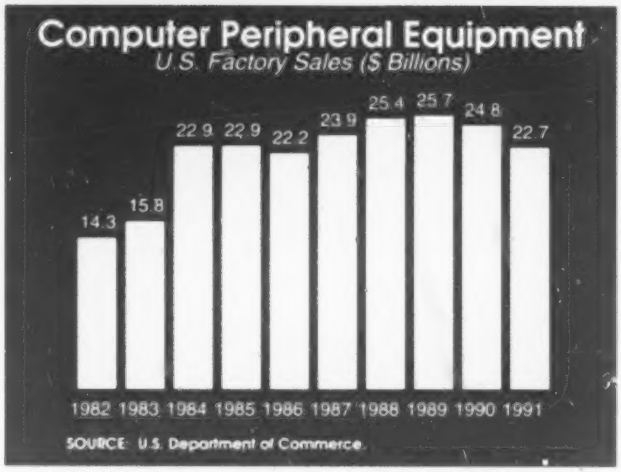
4: COMPUTERS & PERIPHERALS







IN THIS CHAPTER

- ***Computers***
- ***Peripherals***
- ***Computer Tapes & Disks***
- ***CAD/CAM/CAE***
- ***Artificial Intelligence***
- ***Multimedia***

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U.S. SALES/SHIPMENTS

COMPUTER & PERIPHERAL EQUIPMENT Table 4-1

U.S. Factory Shipments ($ Millions): 1983 - 1991

	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]	1992
COMPUTER & PERIPHERAL EQUIPMENT										
Computers and Parts	17,864.9	24,401.4	25,615.6	26,019.7	28,975.0	28,693.1	28,464.3	28,220.3	26,908.1	na
Computer Peripheral Equipment	15,839.8	22,862.8	22,886.5	22,194.9	23,865.0	25,442.9	25,729.3	24,820.1	22,734.9	na
Total	33,704.7	47,264.2	48,502.1	48,214.6	52,840.0	54,136.0	54,193.5	53,040.4	49,643.0	56,360[e]

[r]-Revised
na-Not Available
[e]-Estimated
SOURCE: U.S. Department of Commerce

COMPUTER INDUSTRY

The computer industry enjoyed a banner year in 1992.

The computer industry enjoyed a banner year in 1992. Industry factory sales, including computers, printers, monitors, optical scanners, and many other high-tech productivity enhancing products, grew more than 13.5%, totaling just under $56.4 billion. Overall industry revenues rose in 1992 despite brutal price competition, especially in the desktop personal computer market. The U.S. Department of Commerce estimates that personal computer shipments reached 11.1 million units in 1992 up nearly 10%, adding to the U.S. installed base of over 60 million units.

The past year also saw a revolution in the way computers are sold. The superior reliability of today's computer equipment, along with greater familiarity and confidence among today's computer users, all contributed to the retail and mail order explosion in the computer market. Computers and peripherals can now be found not only in traditional outlets like department stores, but also in warehouse clubs, office and computer superstores, and even in discount mass merchant outlets.

At the end of 1992, the question of what drives the industry was still in question. Is software the engine that drives the car, or does hardware dictate the pace of technological change? During 1992 the answer was a little of both. Microsoft introduced its newest version of the operating system Windows®. It was an instant success. Windows® allows users to navigate complex and powerful programs simply by pointing and clicking a mouse. Application programs in Windows® are activated using pull-down menus and by clicking on graphical icons; but maybe the most important benefit of Windows® is that it brings easy to use multi-tasking capability to the desktop. A user can switch between a wordprocessor, spreadsheet or graphics program with a simple keystroke, without having to exit one program to activate and use another. IBM also introduced the next generation of its PC-based multi-tasking software in 1992. OS/2® has all the benefits of Windows®, and in addition provides better protection against system crashes.

Both programs spawned software revolutions, as developers rushed to the market with programs designed to take advantage of the power these new systems could offer. Not surprisingly, though, more complicated software requires more powerful computers. Windows® and OS/2® both require powerful processors, and large hard disk and memory capacities to work at their optimum. Many manufacturing synergies combined to meet these needs. Intel® helped provide the necessary computing power with the introduction of its latest generation microprocessor, the 80486. This silicon wonder doubled the speed of the previous industry standard, while providing for built-in math co-processing capability. The industry was also aided by reduced prices of memory chips (RAM) and more compact hard disk drives with sharply higher capacity.

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COMPUTERS

More powerful microprocessors, faster and more compact hard disk drives, as well as new generations of super clear displays made their way into portable computers in growing numbers in the past year. According to the U.S. Department of Commerce, sales of notebook portable computers grew 55% in 1992 to $3 billion, as manufacturers brought over 200 new models to market. Despite this growth, laptop portables still make up about 80% of the installed base of all portable computers. Modems continue to gain increased use in portable computers, and with the next generation of personal wireless communications devices ready for introduction, there should be no let up in this trend.

...sales of notebook portable computers grew 55% in 1992 to $3 billion...

The next technological barrier to be broken in the portable computer market is power consumption and battery life. Today's portable computers can run efficiently off battery power for up to 4 hours, but with added features and peripherals, the power drain may be even more rapid. The introduction of flash memory (credit card sized arrays of memory banks which maintain memory with the power turned off) could replace power hungry hard disk drives, and more sophisticated power management software could also help reduce energy consumption and prolong battery life.

As personal computers gain more and more power, workstations are taking on many of the roles of yesterday's mainframes and mini-computers as well as some functions of low-end supercomputers. The U.S. Department of Commerce estimates that worldwide shipments of U.S. produced workstations rose 25% in 1992 to nearly $11 billion, and are forecast to increase 28% in 1993.

...worldwide shipments of U.S. produced workstations rose 25% in 1992 to nearly $11 billion, and are forecast to increase 28% in 1993.

COMPUTERS Table 4-2

U.S. Factory Shipments ($ Millions): 1982 - 1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]
General Purpose Computers:										
Digital										
Less than $500			243.7	279.7	195.6	343.8	261.8	177.4	1,008.4	614.9
$500 to $999			739.9	659.4	274.8	514.6	334.3	186.0	1,862.6	1,402.0
$1,000 to $2,499			3,577.2	2,239.8	1,910.0	2,204.3	2,399.7	2,331.3	2,143.5	2,929.4
$2,500 to $4,999			545.6	2,359.6	3,376.1	4,822.2	5,045.9	5,501.8	3,676.7	4,301.9
$5,000 to $14,999	10,482.7[1]	11,588.5[1]	1,079.0	1,506.2	1,223.8	1,502.7	2,750.7	4,759.5	4,929.2	3,398.8
$15,000 to $49,999			2,690.0	2,513.4	2,894.5	3,114.6	3,996.3	2,102.3	2,059.3	2,632.1
$50,000 to $249,999			4,258.6	2,906.8	2,715.8	2,715.7	2,402.2	3,339.9	3,020.9	2,264.9
$250,000 to $ 1 Million			1,127.3	2,469.1	2,995.2	2,905.7	654.6	724.8	819.7	747.3
Over $1 Million			1,037.3	1,613.5	1,716.2	1,987.6	2,714.6	2,840.3	2,950.6	2,814.3
Analog and Hybrid	87.3	83.9	21.3	19.8	14.8	34.4	41.3	12.1	15.1	9.2
Special Purpose Computers:										
Digital	637.0	846.2	1,517.2	2,429.7	2,085.6	2,322.5	2,343.7	2,991.2	2,905.4	2,849.6
Analog and Hybrid	148.6	183.6	226.3	295.4	623.1	744.6	842.3	110.3	239.3	271.6
Parts for Computers	3,201.0	3,585.5	5,468.9	4,508.7	4,810.3	4,565.1	4,339.0	2,854.3	2,247.2	2,255.7
Automated word processors	1,479.2	1,577.2	1,869.1	1,814.5	1,183.9	1,197.2	566.7	533.1	342.5	416.2
Total	16,035.8	17,864.9	24,401.4	25,615.6	26,019.7	28,975.0	28,693.1	28,464.3	28,220.3	26,908.1

[1] Combined factory shipments for all digital general-purpose computers.
[r]-Revised.
na-Not Available.
SOURCE: U.S. Department of Commerce.

U.S. SALES/SHIPMENTS

COMPUTER PERIPHERAL EQUIPMENT

Table 4-3

U.S. Factory Shipments ($ Millions); 1982 - 1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Auxiliary Storage Equipment:										
Direct Access Storage:										
Rigid Magnetic Disk Drives	3,727.0	3,994.5	4,401.2	4,630.1	4,532.1	4,349.5	5,362.6	4,816.9	4,665.7	3,475.0
Flexible Magnetic Disk Drives			697.1	527.3	415.2	330.8	224.9	375.2	405.4	267.5
Optical Disk Drives	na	na	na	na	na	130.7	116.8	196.1	16.8	139.1
Other	339.7	323.3	325.4	336.7	423.8	675.2	462.9	345.6	365.7	342.6
Serial Access Storage:										
Magnetic Tape Drives	812.4	772.3	890.9	1,111.4	878.8	846.7	1,381.3	1,481.4	1,834.6	1,364.0
Magnetic Storage Media:										
Disks:										
Rigid	738.7	1,053.7	1,017.2	821.7	653.6	650.0	585.7	699.0	659.7	721.0
Flexible (incl. optical)	458.3	690.2	561.5	454.0	418.4	454.6	458.3	612.3	672.2	634.3
Computer Tape, Cassette, Cartridge, and Other Magnetic Tape	80.4	203.9	251.3	394.9	633.5	552.2	712.6	631.6	600.3	576.7
Input/Output Equipment:										
Keyboards	103.4	102.5	80.3	69.6	na	399.8	381.3	451.0	419.7	358.6
Other Keying Equipment	20.2	22.2	24.9	14.6	21.1	14.3	6.8	95.6	48.8	35.9
Media to Media Data Conversion Equipment	78.4	101.7	135.0	na	na	na	175.3	150.1	144.0	105.1
Optical Scanning Devices	119.3	195.4	253.3	253.4	302.7	393.6	504.4	745.1	806.7	612.1
Voice Recognition Devices	na	na	na	na	na	19.6	54.2	40.8	23.8	30.2
Radio Frequency Devices	na	na	na	na	na	na	na	13.7	18.0	14.6
Magnetic Ink Devices	136.1	91.5	78.8	59.8	44.4	65.9	124.8	95.5	91.3	68.8
Magnetic Stripe	na	na	na	na	na	na	na	30.8	32.2	29.9
Other	na	na	na	na	na	na	na			
Printers:										
Serial Type	1,633.6	1,921.6	1,668.9	1,790.9	1,992.9	2,556.2	2,404.0	2,568.2	1,991.0	1,508.6
Line Type						540.7	600.1	499.8	379.5	363.6
Page Type			675.6	650.9	724.5	226.8	457.8	634.3	944.0	1,711.2
Plotters	247.5	232.2	240.8	466.1	564.9	532.7	574.4	672.4	592.2	535.3
Graphics Displays	164.6	188.4	192.7	166.2	145.8	149.2	243.2	150.4	84.2	248.1
Other input/output devices	652.9	606.1	1,092.2	1,156.4	717.0	1,159.0	1,052.6	868.9	689.6	691.9
Terminals:										
General Purpose:										
Single CRT:										
Monochrome and other	2,137.8	2,079.9	1,984.6	638.0	532.5	316.0	356.2	282.2	233.0	191.3
Color				413.7	231.9	138.1	106.7	67.0	175.4	225.9
Teleprinters	496.4	449.7	369.3	170.4	496.0	319.9	305.5	303.4	240.2	92.3
Multistation CRT/Teleprinter	109.0	122.9	72.1	43.6	135.9	116.4	63.9	98.2	216.0	194.3
Other	397.5	685.5	799.2	814.6	823.8	564.8	990.5	1,398.4	868.5	917.0
Special Purpose:										
Graphic	454.5	770.1	952.0	687.3	609.6	508.0	594.0	509.3	287.9	248.1
Other	252.1	248.4	241.7	242.7	436.1	466.1	255.8	100.7	45.7	42.0
Funds Transfer	na	na	na	306.9	287.7	287.6	287.1	290.1	265.8	208.9
Point-of-Sale (POS)	na	na	na	413.6	475.9	496.8	404.0	708.9	547.3	504.3
Other Peripheral Equipment	1,041.9	1,044.9	1,333.5	1,632.8	1,610.0	1,450.2	633.5	1,254.5	1,431.6	881.2
Parts for Peripheral Equipment	3,806.6	3,933.4	4,523.3	4,616.9	4,086.8	5,153.6	5,561.7	4,541.9	5,023.6	5,395.5
Total	14,281.3	15,839.8	22,862.8	22,886.5	22,194.9	23,865.0	25,442.9	25,729.3	24,820.1	22,734.9

r-Revised.
na-Not Available.
SOURCE: U.S. Department of Commerce.

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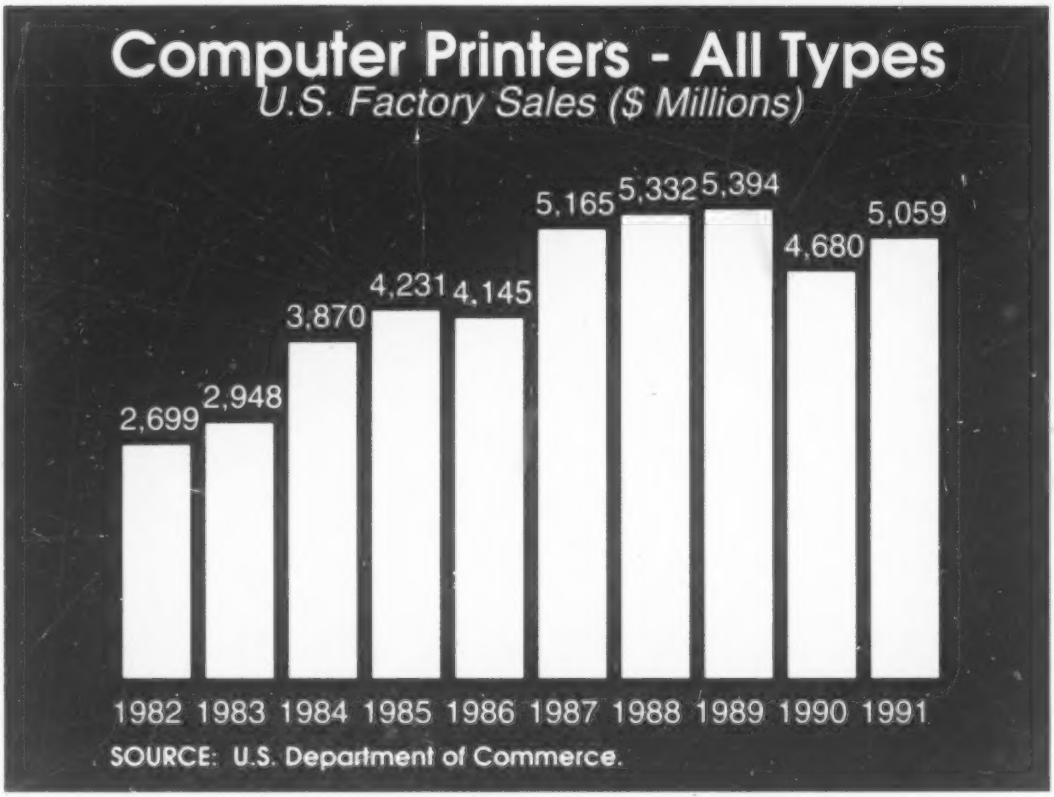
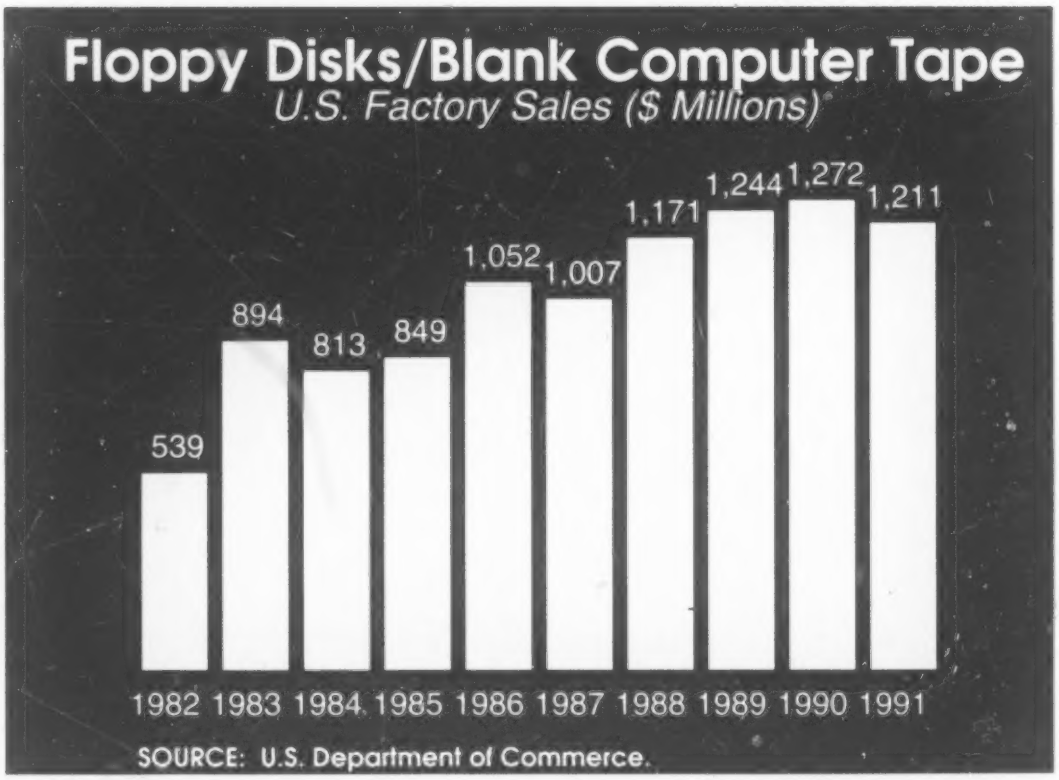
U.S. SALES/SHIPMENTS





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U.S. SALES/SHIPMENTS

CAD/CAM

The traditional Computer-Aided Design (CAD)/Computer-Aided Manufacturing (CAM) industry has exploded into four separate and distinct markets encompassing:

- CAD/CAM/Computer-Aided Engineering (CAE) - this software is used predominantly in the manufacture of products such as aircraft, automobiles, or home appliances;
- Electronic Design Automation (EDA) - EDA software is popular in the design of microscopic electronic components, printed circuit boards and multi-chip modules (MCMs);
- Geographic Information Systems (GIS) - GIS systems help governments and municipalities plan for gas, water, sewer lines, and the electric power grids of the future; and
- Architectural, Engineering, and Construction (AEC) - AEC software aids civil engineers in the construction of roads and bridges.

Most of these design software formats run effectively on today's desktop computers and workstation environments, but the industry has been hurt the last two years by the recessions in the United States, Europe and Japan and the accompanying slowdown in global investment. According to Dataquest, the worldwide market for engineering design computer hardware and software increased 9% to $15 billion in 1992. In the United States market, shipments of engineering/design computer equipment and software took a big drop in 1992, falling 10% to $4.8 billion.

AI

Expert systems remain the fastest growing sector of the Artificial Intelligence (AI) market. Expert systems are so named because they are programmed to have the working knowledge and inference capabilities of a "human expert," but in concentrated fields. They can not think, but they can take categorized input, process it, and make decisions based on that input. Expert systems applications include: by banks to process credit applications and by several industries as an interface for consumer help lines.

Neural networks are a different kind of AI system altogether. Instead of relying on complex and specialized software, "neural nets" work with highly interconnected processing systems patterned after the human brain. Neural nets are finding increasing application in tax processing, stock prediction, energy management, and many other areas.

A more "every day" AI application may be fuzzy logic. Fuzzy logic processors work by allowing for statements such as "not very likely" and "almost" to be programmed into microprocessors. Applications are found in building temperature control, subway car control, and automatic transmissions in automobiles.

MULTIMEDIA PRODUCTS

According to the analysis of *Market Vision*, a multimedia consulting firm, the market for multimedia products was roughly $600 million in 1991. The lion's share of that total (75%) was accounted for by sales to the business and dedicated professional markets. By 1996 Market Vision expects a much different picture, as the market for multimedia products is forecast to swell to $12.4 billion with 57% of sales going to the consumer market, while the business and professional markets drop to a combined 38% of the total multimedia pie.

Currently, the most popular component of any multimedia system is the optical disk. These optical disks are encoded using laser technology and can store vast amounts of information. The most popular size on the computer desktop is the 5 1/4" disk, which is the same size as the now commonplace audio CD. According to the *Disk Trend*, worldwide sales of optical disks (CD-ROM, rewritable, erasable and multifunction) will reach $2.9 billion by 1995, a compound annual growth rate of 25% from 1991. That pales in comparison to the potential size of the market for optical disk software. Based on estimates prepared by *Infotech*, the worldwide market for optical disk software should reach $9.7 billion by 1995, from $2.6 billion in 1991.

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TRADE TRENDS

COMPUTERS & PERIPHERAL EQUIPMENT Table 4-5
U.S. Imports and Exports ($ Millions), 1990-1992

	1990	1991	1992
Imports	22,905	26,623	32,382
Exports	27,774	28,835	30,356
Balance of Trade	4,869	2,212	(2,026)

SOURCE: U.S. Department of Commerce,
compiled by EIA Marketing Services Department.

COMPUTERS & PERIPHERALS

Bilateral trade in computers & peripherals resulted in the first full-year trade deficit on record for the industry. U.S. exports totaled $30.4 billion, while imports reached $32.4 billion, resulting in a trade deficit of $2 billion. The sluggishness of exports came in part by slower foreign economic growth but also from dropping prices. Falling prices for computers bely the fact that growth in unit exports of computer systems has remained strong over the last two years. Canada and Japan were the top-two markets for U.S. made computer equipment in 1992, with purchases of $4.7 billion and $3.6 billion, respectively. Japan was far and away the largest supplier to the U.S. market, predominantly in the form of monitors, printers, and other peripherals.

COMPUTERS & PERIPHERAL EQUIPMENT Table 4-6
U.S. Imports ($ Millions), 1990-1992

CATEGORY	1990	1991	1992
Computers	2,551	3,992	4,597
Monitors	2,430	2,979	3,922
Disk Drives and Blank Computer Media	6,648	7,126	9,425
Printers	2,350	2,528	3,058
Other Computer Peripherals	749	794	794
Other Business Machines and Parts	8,178	9,255	10,588
TOTAL	22,905	26,623	32,382

SOURCE: U.S. Department of Commerce,
compiled by EIA Marketing Services Department.

COMPUTER & PERIPHERAL EQUIPMENT Table 4-7
U.S. Exports ($ Millions), 1990-1992

CATEGORY	1990	1991	1992
Computers	7,950	8,024	8,471
Monitors	544	648	742
Disk Drives and Blank Computer Media	4,945	5,428	5,831
Printers	1,035	1,171	1,356
Other Computer Peripherals	1,187	1,123	1,214
Other Business Machines and Parts	11,646	12,404	12,742
TOTAL	27,774	28,835	30,356

SOURCE: U.S. Department of Commerce,
compiled by EIA Marketing Services Department.

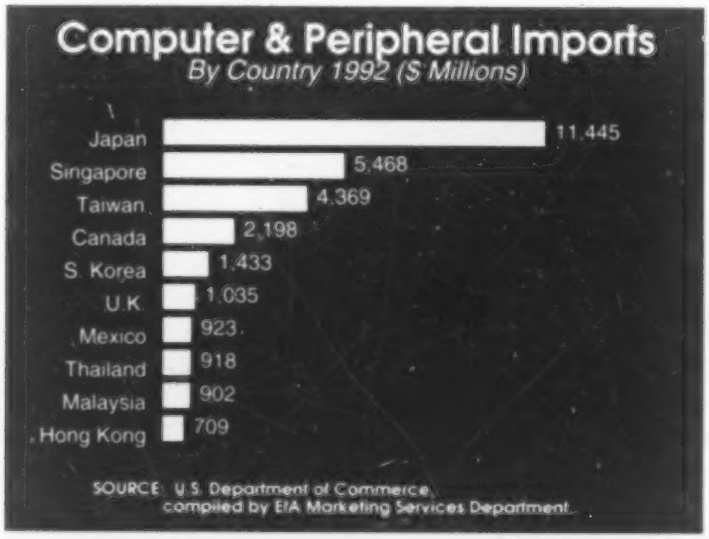
TRADE TRENDS

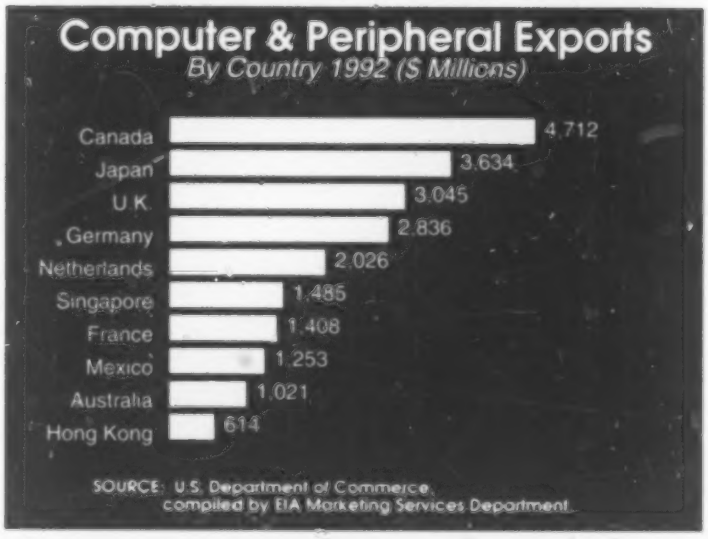
COMPUTER & PERIPHERAL EQUIPMENT — Table 4-8

U.S. Bilateral Trade ($ Thousands), 1992

IMPORTS		% of Total	EXPORTS		% of Total
Japan	11,444,976	35.3%	Canada	4,712,206	15.5%
Singapore	5,468,472	16.9%	Japan	3,633,817	12.0%
Taiwan	4,369,385	13.5%	U.K.	3,044,754	10.0%
Canada	2,197,666	6.8%	Germany	2,835,947	9.3%
S. Korea	1,433,231	4.4%	Netherlands	2,025,982	6.7%
U.K.	1,035,057	3.2%	Singapore	1,484,848	4.9%
Mexico	923,499	2.9%	France	1,407,803	4.6%
Thailand	918,017	2.8%	Mexico	1,252,564	4.1%
Malaysia	901,570	2.8%	Australia	1,021,069	3.4%
Hong Kong	709,039	2.2%	Hong Kong	614,223	2.0%
Other	2,982,688	9.2%	Other	8,321,839	27.4%
TOTAL	32,383,600	100.0%	TOTAL	30,355,051	100.0%

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.





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COMPUTERS & PERIPHERALS

Table 4-9

U.S. Historical Macroeconomic Data (Millions of Dollars), 1990-1992

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
FACTORY SALES													
1990	3,295	3,863	5,372	3,527	3,842	5,812	3,246	3,899	5,751	4,169	4,150	6,115	53,040
1991	3,087	3,513	4,907	3,323	3,579	5,410	3,129	3,658	5,064	3,959	4,268	5,745	49,643
1992	3,419	3,815	5,453	3,728	4,037	6,441	3,677	4,173	5,928	4,033	4,808	6,848	56,360
NEW ORDERS													
1990	3,005	3,657	4,911	3,536	3,788	4,948	3,531	3,295	5,791	3,604	3,882	4,958	48,907
1991	3,320	3,557	4,848	3,240	3,958	5,316	3,155	3,661	4,825	3,725	4,062	4,841	48,508
1992	3,408	3,902	5,585	3,770	4,360	6,517	3,626	4,513	6,193	4,265	4,933	6,839	57,913
INVENTORY													
1990	9,592	9,705	9,341	9,702	9,846	9,237	9,590	9,767	9,462	9,359	9,248	8,586	9,453
1991	8,338	8,516	8,148	8,308	8,412	7,830	8,264	8,238	8,127	8,136	8,093	7,431	8,153
1992	8,086	8,028	7,795	7,957	8,155	7,586	7,916	8,217	8,006	8,259	8,322	7,449	7,982

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
IMPORTS													
1990	1,810	1,742	2,008	1,845	1,723	1,949	1,873	1,875	1,879	1,977	1,985	2,239	22,905
1991	1,887	1,952	2,231	2,007	2,081	2,292	2,282	2,287	2,389	2,370	2,286	2,559	26,623
1992	2,063	2,206	2,601	2,357	2,435	2,841	2,729	2,873	3,002	2,893	737	775	27,512
EXPORTS													
1990	2,170	2,132	2,734	2,165	2,142	2,413	2,169	2,142	2,435	2,428	2,221	2,623	27,774
1991	2,300	2,224	2,863	2,450	2,283	2,465	2,153	2,158	2,388	2,422	2,484	2,645	28,835
1992	2,192	2,386	2,836	2,434	2,359	2,700	2,234	2,253	2,722	2,587	2,551	3,102	30,356

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Avg.
FINISHED EQUIPMENT FACTORY PRICE INDEX (12/90=100)													
1990	109.5	107.7	105.9	105.0	104.2	103.4	103.1	102.8	102.5	101.7	100.8	100.0	103.9
1991	98.3	97.7	96.6	96.2	92.2	89.4	85.5	81.5	81.4	80.6	80.2	79.2	88.2
1992	78.9	78.5	77.2	76.2	75.8	74.8	74.3	74.2	73.4	73.2	73.0	72.9	75.2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Avg.
EIA COMPUTERS & PERIPHERALS STOCK INDEX (1/91=100)													
1991	100.00	105.28	106.32	101.85	102.27	93.15	99.00	98.49	95.69	95.46	91.72	95.26	98.71
1992	107.54	111.23	104.79	102.69	100.27	93.88	93.58	96.45	96.49	96.78	93.55	92.24	99.12

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

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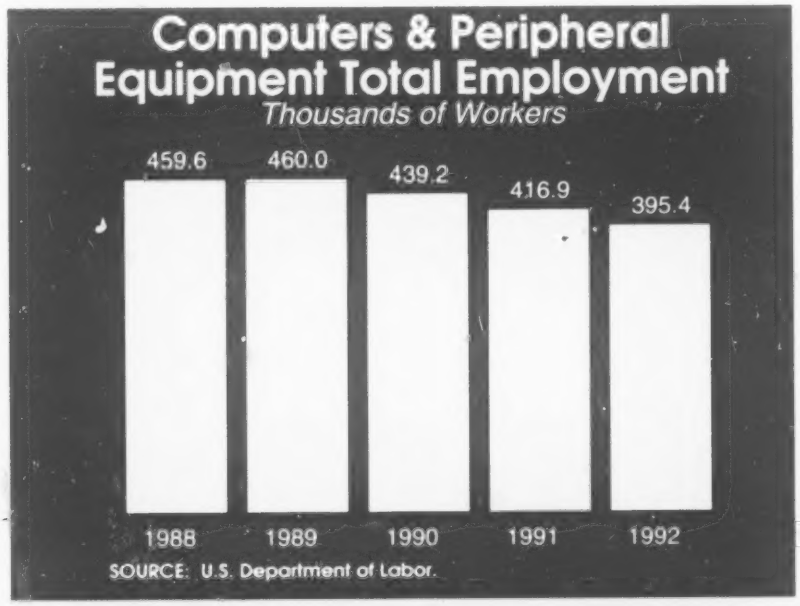
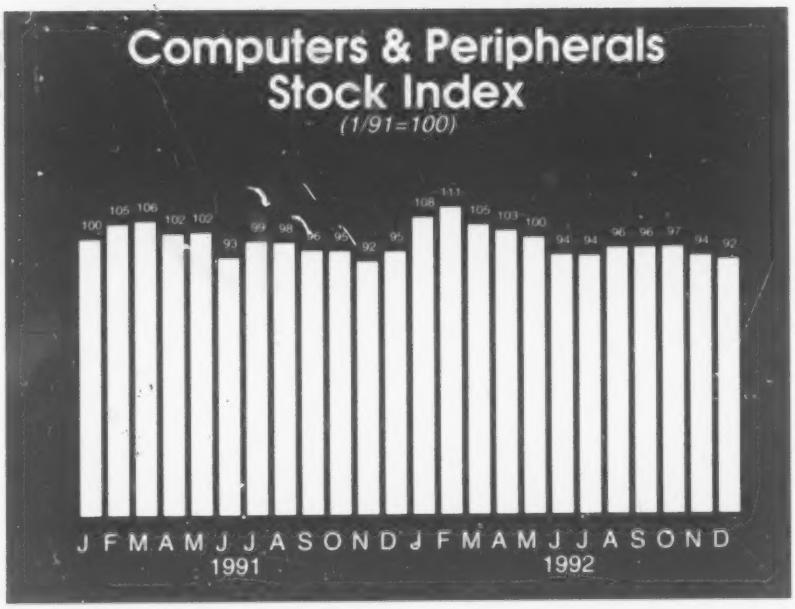
ECONOMIC OVERVIEW

COMPUTERS & PERIPHERALS EQUIPMENT EMPLOYMENT Table 4-10
U.S. (Thousands of Workers), 1988-1992

	1988	1989	1990	1991	1992
All Employees	459.6	460.0	439.2	416.9	395.4
Production Workers	147.9	145.6	137.5	135.9	130.5
Women Employees	157.1	157.2	150.1	142.5	135.1
Wage Index (12/88=100)	102.7	104.8	108.1	115.6	115.9

SOURCE: U.S. Department of Labor, compiled by EIA Marketing Services Department.





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ECONOMIC OVERVIEW

ELECTRONIC COMPUTERS (SIC Code 3571) Table 4-11
U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
California	62,067	24.2
New York	36,379	14.2
Massachusetts	34,469	13.4
Texas	27,168	10.6
Minnesota	23,253	9.1
TOTAL	256,420	100.0

Note: Additional detail on employment is available from the EIA Research Center. Please see front inside cover for details.

COMPUTER STORAGE DEVICES (SIC Code 3572) Table 4-12
U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
California	10,890	29.5
Colorado	6,744	18.3
Minnesota	6,275	17.0
Oklahoma	2,146	5.8
North Carolina	881	2.4
TOTAL	36,940	100.0

SOURCE: Employment and Wages Annual Averages, 1991, U.S. Department of Labor, Bureau of Labor Statistics

COMPUTER TERMINALS (SIC Code 3575) Table 4-13
U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
California	2,354	11.1
Colorado	278	1.3
Minnesota	257	1.2
Michigan	255	1.2
TOTAL	21,219	100.0

SOURCE: Employment and Wages Annual Averages, 1991, U.S. Department of Labor, Bureau of Labor Statistics.

COMPUTER PERIPHERAL EQUIPMENT, NEC (SIC Code) Table 4-14
U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
California	15,658	27.2
Washington	4,501	7.8
Massachusetts	3,586	6.2
Colorado	3,288	5.7
Minnesota	3,283	5.7
TOTAL	57,559	100.0

NEC - Not elsewhere classified.
SOURCE: Employment and Wages Annual Averages, 1991, U.S. Department of Labor, Bureau of Labor Statistics.

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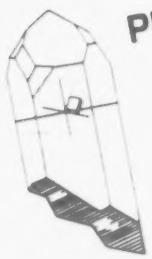

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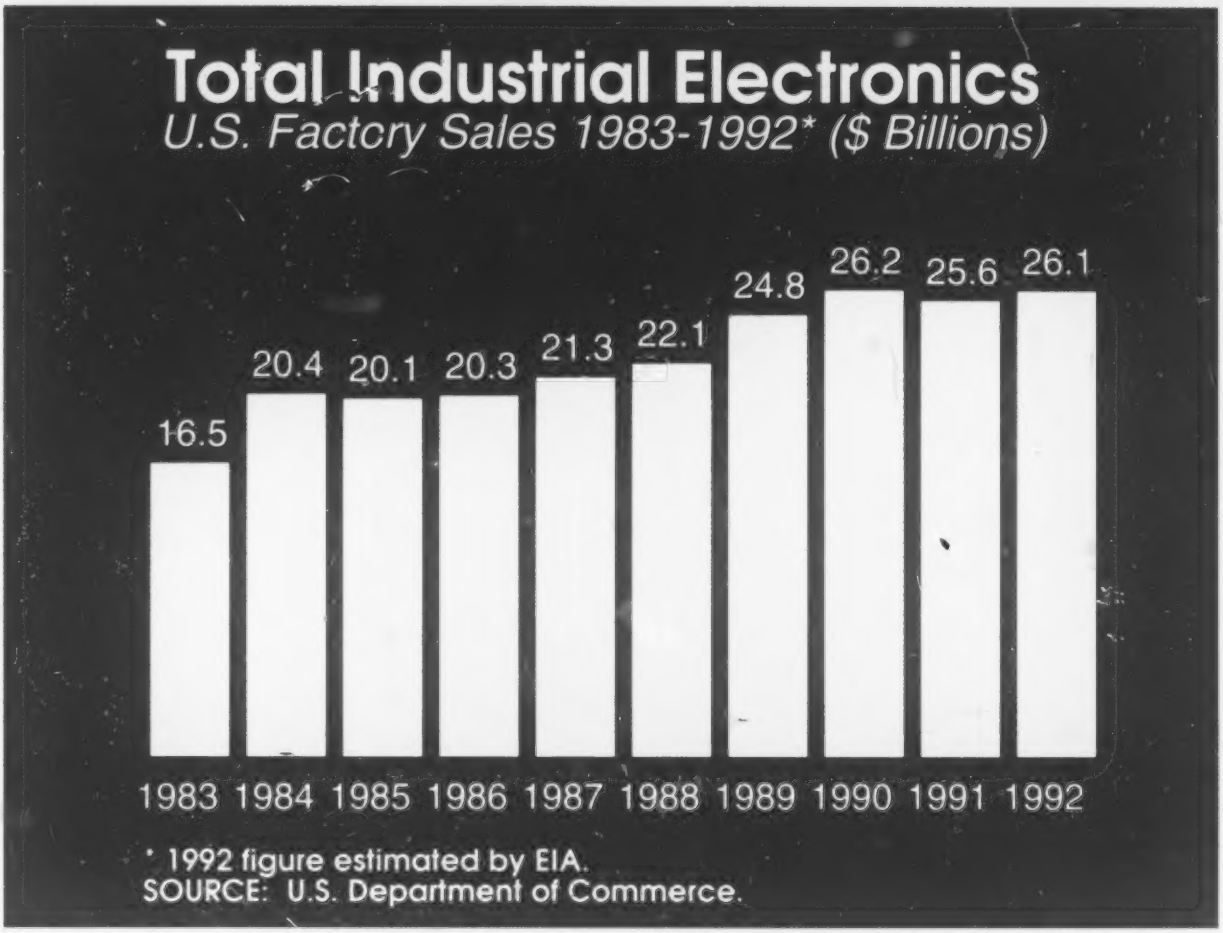

IN THIS CHAPTER

- ***Medical Electronics***
- ***Control & Processing Equipment***
- ***Testing & Measuring Equipment***
- ***Nuclear Electronics***
- ***Robotics***

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U.S. SALES/SHIPMENTS

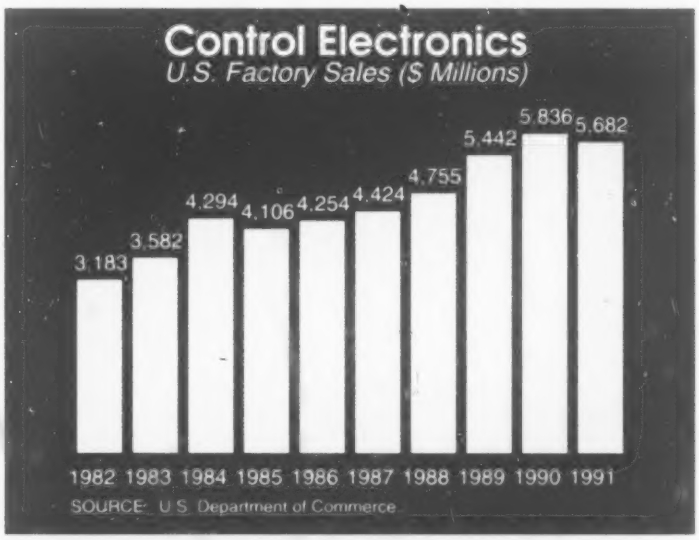
INDUSTRIAL ELECTRONICS

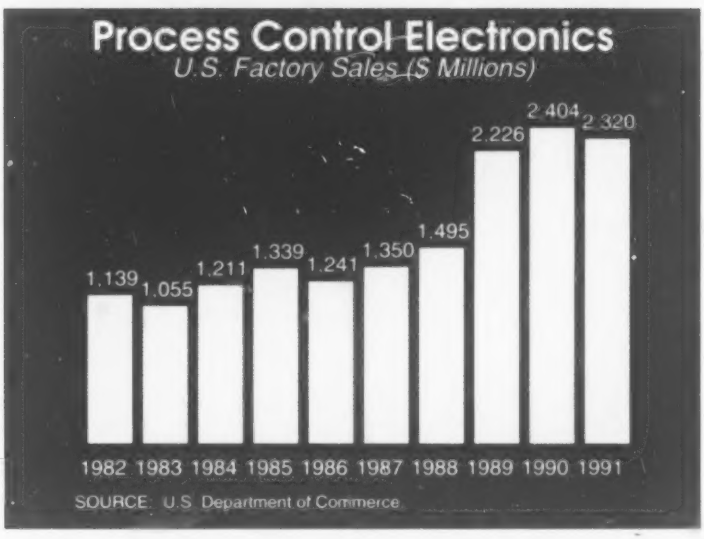
TABLE 5-1

U.S. Factory Shipments ($ Millions); 1983 - 1991

	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]	1992
INDUSTRIAL ELECTRONICS										
Control and Processing Equipment	7,428.3	8,682.7	8,719.0	8,924.2	9,192.6	9,860.8	11,991.9	12,728.0	12,118.0	na
Testing and Measuring Equipment	5,200.4	6,279.1	6,007.9	5,735.8	6,008.7	5,806.5	5,953.1	6,859.1	6,671.4	na
Nuclear Electronics	489.5	479.7	518.6	559.6	600.7	615.9	606.0	566.8	583.4	na
Robots, Accessories, and Components	na	281.2	345.2	346.0	284.4	228.7	256.0	275.0	294.3	na
Other Electronic Systems & Equipment	3,412.4	4,665.0	4,530.1	4,720.4	5,238.3	5,587.9	5,991.5	5,753.7	5,920.0	na
TOTAL	16,530.6	20,387.6	20,120.9	20,286.0	21,324.6	22,099.8	24,798.5	26,182.5	25,587.0	26,130[e]

[r]-Revised
na-Not Available
[e]-Estimated
SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.





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U.S. SALES/SHIPMENTS

CONTROL & PROCESSING EQUIPMENT

TABLE 5-2

United States, Factory Shipments ($ Millions): 1982 - 1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
CONTROLS										
A.C. full voltage starters, contractors, reduced voltage controls, 1000 volts or less	372.2	325.9	349.7	313.7	386.4	400.8	383.1	556.8	479.7	464.5
Motor control centers, 1000 volts or less	214.9	242.2	250.5	282.2	261.8	243.1	251.9	337.0	353.1	356.4
Starters and contractors for squirrel cage and wound rotor and synchronous motors, over 1000 volts, air break and oil immersed	66.0	80.7	47.4	49.6	49.9	44.2	52.2	129.5	64.1	69.6
Pilot circuit devices, such as limit switches, interval timers, photoelectric devices	213.8	200.3	305.7	271.3	323.7	362.6	424.5	418.8	409.2	413.5
Other general industry devices: Pushbuttons, Rheostats and Resistors, Brakes, Synchronous Motor Starters	242.7	266.8	319.1	282.0	301.1	305.0	340.7	375.9	361.3	346.2
Marine and Navy auxiliary controls and accessories	173.3	189.1	160.9	161.3	179.4	175.9	204.9	228.4	na	na
Metal mill	na	na	na	na	na	na	na	na	237.9	243.8
Crane and hoist controls	29.4	20.1	28.3	26.9	20.3	25.7	37.0	37.5	47.5	47.6
Adjustable speed drives	270.4	245.6	320.8	353.1	381.9	440.9	522.5	616.5	671.8	666.9
Numerical controls	534.3	599.0	910.0	843.6	815.6	741.3	802.6	821.5	929.6	819.2
Other controls and parts	1,046.0	1,411.8	1,602.1	1,522.3	1,533.5	1,684.3	1,735.3	1,919.8	2,281.9	2,254.6
PROCESS CONTROLS										
Temperature	116.7	97.0	131.0	137.8	128.6	181.0	175.0	575.2	581.2	547.8
Pressure, draft and vacuum	141.2	128.4	154.9	168.5	168.5	185.2	204.3	386.2	411.7	411.3
Flow and Liquid Level	547.7	508.3	585.1	623.9	593.8	628.5	694.3	803.5	939.8	871.8
Humidity instruments	16.6	16.2	18.9	19.1	18.5	24.4	29.0	21.1	23.7	21.2
Continuous process gas and liquid analysis	218.9	220.5	229.7	273.2	233.1	238.3	276.2	327.2	335.6	362.3
Instruments for other variables (speed, viscosity, position, density, specific gravity, sequence, etc.), includes mechanical types	95.6	84.3	91.7	116.5	98.5	92.7	115.9	113.2	112.0	105.2
CONTROL & PROCESSING DISPLAYS										
(operate from standard transmitted signals excl. aux. station). Electronic systems (unified architecture type):										
Controllers	131.4	145.4	109.4	92.0	104.6	105.7	126.6	153.4	179.7	161.6
Recorders	72.5	65.6	75.6	76.9	71.3	91.7	74.4	76.0	77.4	77.1
Indicators	32.8	32.6	26.9	40.7	35.1	36.7	41.6	43.2	44.0	40.8
Electronic-systems (non-unified architecture type)	519.1	440.9	651.7	705.6	690.1	778.2	860.3	1,038.9	1,094.8	929.7
Multi-function process computers	175.3	171.2	143.6	135.4	154.0	177.9	177.9	181.6	238.5	239.2
Pneumatic system (excl. aux. station)	62.7	78.5	62.3	66.3	60.7	59.5	64.4	57.1	84.1	74.0
Annunciators	33.3	13.3	20.5	36.7	38.5	22.3	25.8	26.2	19.9	23.2
Physical properties testing and inspection equipment	371.4	365.1	394.7	408.8	493.5	533.9	547.0	777.1	827.9	847.7
Kinematic test and measuring equipment	140.6	128.8	164.0	112.5	130.3	148.9	148.9	177.4	184.5	176.0
Automatic regulating devices	495.3	504.8	507.6	622.4	608.6	514.7	605.7	897.4	602.2	595.9
Other process instruments	509.9	409.5	579.4	621.6	791.5	727.2	680.7	587.1	717.1	620.4
Parts of Process Instruments	497.0	436.3	441.2	355.2	251.4	222.0	258.2	308.4	417.8	330.5
TOTAL	7,363.0	7,428.3	8,682.7	8,719.0	8,924.2	9,192.6	9,860.8	11,991.9	12,728.0	12,118.0

SOURCE: U.S. Department of Commerce.

CONTROLS

Industrial controls are a crucial element in the manufacture of a wide range of goods. These electronic instruments measure and control the flow, temperature, humidity, and pressure of gases and liquids. They provide feedback to computer systems and to human operators, providing vital information to fine-tune the production process. Industrial controls are commonly used in the petroleum, chemical, food processing, and pharmaceutical industries.

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U.S. SALES/SHIPMENTS

NUMERICAL CONTROLS **TABLE 5-3**

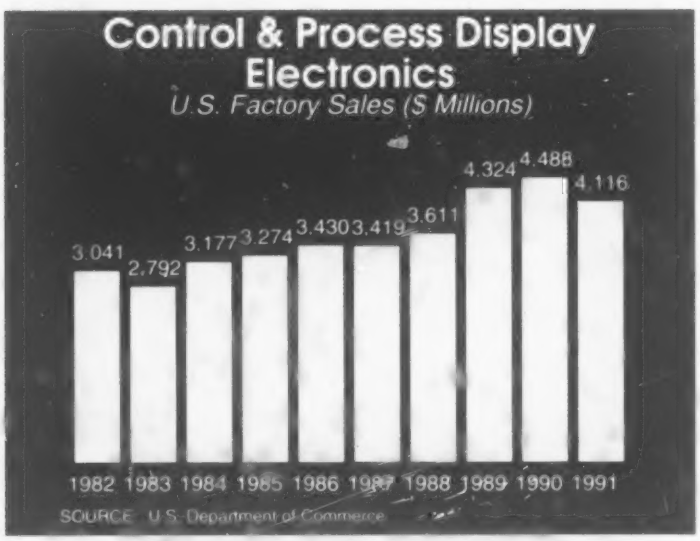
U.S. Factory Shipments ($ Millions); 1982 - 1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Controls for numerically controlled machine tools:										
Positioning type	14.0	14.4	18.7	16.4	19.5	20.3	19.2	20.8	39.7	33.0
Continuous path type	139.1	105.5	154.1	147.9	125.3	101.8	90.4	90.8	144.6	125.6
Digital readout systems, including dial and plug board type	35.0	32.4	22.6	18.7	18.4	19.0	18.1	17.9	12.2	12.8
Programmable controllers (sold separately)	366.2	447.2	714.6	660.6	652.4	600.2	674.9	692.0	733.1	647.7
Robots	na	na	281.2	345.2	346.0	284.4	228.7	256.0	275.0	294.3
Total	554.3	599.5	1,191.2	1,188.8	1,161.6	1,025.7	1,031.3	1,077.5	1,204.6	1,113.4

na-Not Available.
SOURCE: U.S. Department of Commerce.

ADVANCED CONTROLS

Industrial electronics are increasingly becoming powerful specialized computer processing units. Advanced technologies such as fuzzy logic, neural networks, and expert system controls provide for continuous updating of information and put into action instantaneous adjustments needed for optimum production. As systems become more sophisticated and powerful, they are being linked within and between manufacturing facilities, providing a wealth of information to engineers and operations analysts.



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U.S. SALES/SHIPMENTS

ROBOTS, ACCESSORIES & COMPONENTS

TABLE 5-4

U.S. Factory Shipments ($ Millions); 1984 - 1991

	1984	1985	1986	1987	1988	1989	1990	1991
Servo-Controlled Robots:								
Point-to-Point Type:								
Welding, soldering, brazing, and cutting	56.9	74.6	86.0	64.6	32.3	29.3	28.0	30.0
Foundry, forging, and heat treating	1.9	0.7	3.2	3.4	3.2	9.3	10.0	10.7
Inspection, measuring, gauging and sorting								
Plastics molding/forming	na	na						
Metal bending, shearing/forming			3.7					
Drilling/cutting	na	na						
Machine tool loading and unloading	4.1	3.8						
Assembly	20.9	17.8	19.1	19.6	8.0	8.1	9.0	9.6
Material handling and parts transfer n.e.c.	35.4	44.9	45.1	48.3	27.0	26.0	25.0	26.8
Other								
Continuous-Path Type:								
Welding, soldering, brazing, and cutting	16.6	22.4	13.8	9.0	3.7	2.2	2.0	2.1
Spraying, painting, gluing, and sealing	46.0	41.4	36.9	41.3	30.1	35.1	38.0	40.7
Other, including fettling, grinding, polishing and deburring	24.3	49.3	48.1	16.8	33.4	25.6	27.0	28.9
Non-Servo-Controlled Robots	16.2	18.0	15.7	8.2	17.1	14.9	15.0	16.1
Other Robots, Including Educational, Hobby, and Experimental	3.3	2.8	3.0	8.6	na	na	na	na
Robot Accessories, Subassemblies, Components and Parts Sold Separately:								
End-of-Arm tooling	1.3	3.7	8.4	6.1	3.3	3.5	4.0	4.3
Vision, sonic, force, tactile and proximity sensors	15.2	17.7	14.8	15.6	18.2	20.5	22.0	23.5
Interface modules			1.7	0.8	1.3	2.0	3.0	3.2
Compliance devices								
Joint locating and guidance systems for welding	10.8	4.9	1.2	4.0	5.7	6.3	7.0	7.5
Guarding and safety devices			1.7					
Other accessories, etc.	28.3	43.2	43.6	38.1	45.4	73.2	85.0	91.0
TOTAL	281.2	345.2	346.0	284.4	228.7	256.0	275.0	294.3

na-Not Available.
SOURCE: U.S. Department of Commerce.

ROBOTICS

In 1992 U.S.-based robotics' companies posted a 21.5% increase in new orders, totaling 5,261 robots valued at $495.9 million, according to the Robotics Industries Association. Robot shipments totalled 4,561 units in 1992 valued at $455.8 million, while the unit figure is the highest in six years, the dollar value fell 3% from 1991.

Industrial robots can efficiently paint, weld, seal, assemble, and package various goods, often with precision unmatched by human workers or under adverse conditions. New applications are opening up in service sectors, such as polishing floors or delivering hospital meals. As the year 2000 approaches, robot technology advances are expected in integration, controls, sensors, and programming.

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U.S. SALES/SHIPMENTS

TESTING & MEASURING EQUIPMENT

TABLE 5-5

U.S. Factory Shipments ($ Millions): 1982 - 1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990r	1991r
A.C. watt-hour meters	142.9	179.3	181.1	197.1	186.1	183.0	157.4	175.6	157.1	152.2
Combined watt-hour and demand meters and time switch meters	69.6	74.8	85.4	94.4	103.2	101.4	118.6	123.5	139.4	111.7
Other integrating meters and instruments and parts	126.5	103.9	151.9	111.1	113.6	116.0	111.6	102.3	99.6	94.2
Voltage, current and resistance measuring equipment	208.5	228.8	269.9	276.0	260.9	302.3	283.8	290.7	267.3	265.5
Multimeters	105.1	103.9	126.6	132.9	127.0	136.4	132.1	149.2	146.5	132.8
Power and energy measuring equipment	19.3	53.8	59.2	80.2	101.0	98.4	79.1	85.8	99.3	92.1
Frequency measuring	98.4	108.7	113.9	136.6	123.5	112.2	104.1	112.7	103.4	94.2
Waveform measuring and/or analyzing equipment	675.5	678.2	738.6	743.5	679.3	658.3	406.7	416.6	722.3	717.9
Signal generating equipment	278.6	327.8	351.2	315.3	324.7	356.8	279.0	296.8	267.3	272.0
Field strength and intensity measuring	128.9	155.4	211.4	248.8	231.3	na	na	na	na	na
Impendance and standing wave ratio measuring	49.7	35.9	54.4	43.7	49.0	48.2	48.8	43.4	40.2	37.2
X-Y plotters	167.5	182.6	263.4	34.1	33.7	19.3	15.9	7.9	5.2	6.1
Time measuring & counting equipment	31.5	na	na	na	na	na	na	na	na	na
Automatic testing and measuring equip										
Combination/Group testing sets	562.6	621.1	555.7	611.0	590.1	622.2	507.4	530.9	584.9	545.6
Component part test sets										
Electron tubes/Semiconductors	256.4	249.3	475.6	469.6	459.5	564.5	580.6	570.1	822.6	827.5
Other	69.0	115.6	201.2	182.6	236.0	459.3	533.5	508.8	400.7	428.4
Other	190.4	201.5	183.2	159.9	167.6	297.8	390.6	355.4	230.9	243.1
Standards and calibration	133.8	132.5	130.7	183.8	145.0	185.9	195.7	185.8	147.1	150.1
Microwave test	120.5	33.6	36.2	34.3	34.8	47.2	54.3	45.1	55.4	41.0
Communications testing (excl. microwave)	na	39.0	178.3	262.5	259.4	363.4	446.4	435.8	437.3	478.1
Internal combustion engine analyzers	220.9	232.3	306.6	311.6	296.1	273.6	280.8	272.8	363.8	332.0
Associated devices for testing and measuring	77.8	117.6	225.4	na	na	na	na	na	323.5	293.6
Other testing, measuring and analyzing	961.6	1,224.8	1,379.2	1,378.9	1,214.0	1,062.5	1,080.1	1,244.1	1,445.1	1,355.7
TOTAL	4,695.0	5,200.4	6,279.1	6,007.9	5,735.8	6,008.7	5,806.5	5,953.1	6,859.1	6,671.4

na-Not Available
r-Revised
SOURCE: U.S. Department of Commerce

TEST AND MEASURE

Test and measure instruments are designed to measure and control the flow of electricity, such as signal generators, multimeters, oscilloscopes, and spectrum analyzers. These products are not designed to measure large voltage flows, but rather are used to measure electrical flow in products such as semiconductors, printed circuit boards, communications equipment.

The digital transformation has clearly taken hold in the industrial electronics industry. By increasing the speed and power of test and measurement sets, applications to the computer and telecommunications sectors are increasing. Small, lightweight units will make complete portable systems a reality, which should increase their use in a broadening range of applications.

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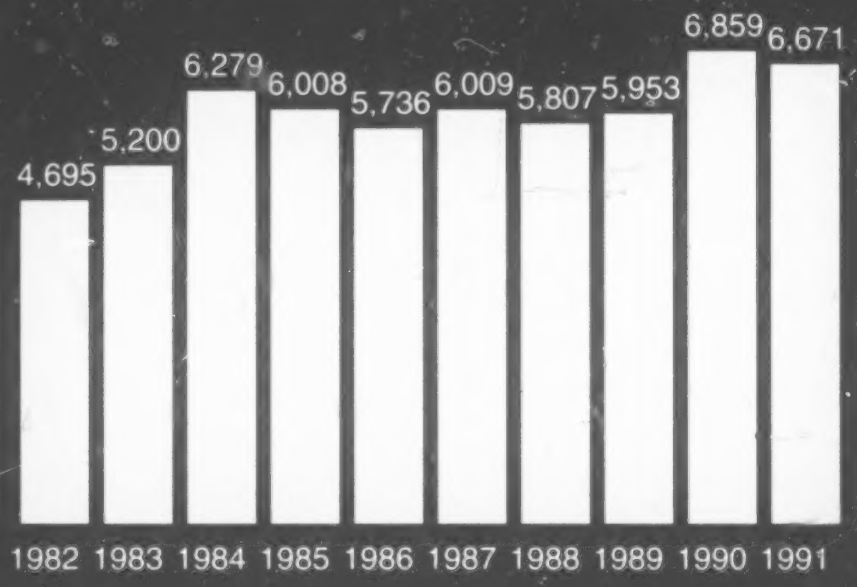
U.S. SALES/SHIPMENTS

Testing & Measuring Electronics

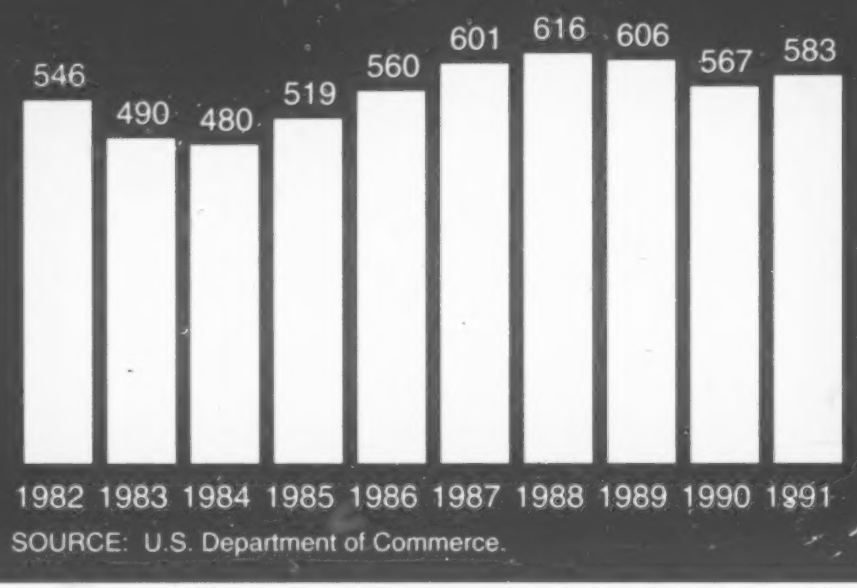
U.S. Factory Sales ($ Millions)



SOURCE: U.S. Department of Commerce.

Radiation Detection/Measuring Electronics

U.S. Factory Sales ($ Millions)



SOURCE: U.S. Department of Commerce.

U.S. SALES/SHIPMENTS

NUCLEAR RADIATION DETECTION & MONITORING INSTRUMENTS

TABLE 5-6

U.S. Factory Shipments ($ Millions); 1982 - 1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]
Radiation detecting elements, including chambers, sold separately	46.6	39.0	38.4	35.7	36.8	65.3	66.9	88.0	81.3	77.3
Solid state detectors sold separately			14.2	16.9	19.9	19.5	21.7	35.2	36.3	36.1
Nuclear monitoring instruments, including environmental, personal dosimetry, and medical monitors, stationary and portable	103.9	93.7	126.6	120.6	125.9	126.4	111.7	169.2	114.1	117.6
Medical and biological counting systems in vivo counting										
Sample flow counting systems	28.7	29.5	34.7	36.0	33.1	30.7	35.1	28.6	30.1	38.2
Scalers sold separately	12.1	11.2	2.5	2.4	4.2	4.9	8.9	8.7	6.1	7.2
Special amplifiers for nuclear applications	5.7	6.1	7.1	5.2	4.2	4.0				
Pulse analyzers, including nuclear spectrometers	32.9	26.9	27.7	20.4	33.8	27.3	28.9	18.2	18.2	17.1
Count rate meters	0.9	1.6	9.1	6.6	4.6	3.9	2.8	3.4	3.5	2.8
Measurement and control devices using beta, gamma, or neutron guage technology	129.9	106.7	119.1	128.1	133.1	160.4	186.1	90.4	97.8	99.3
Input-output accessories for multichannel analyzers	1.5	1.8	7.6	12.4	10.6	9.9	13.1	8.1	8.6	8.2
Nuclear power supplies	9.4	5.4								
Neutron & photon activation analysis systems										
Nuclear instrument modules	27.7	25.4	17.9	16.9	17.0	29.1	27.6	30.9	47.1	51.4
Other nuclear radiation detection and monitoring instruments	146.8	140.2	74.8	117.4	136.4	119.3	113.1	125.3	123.7	128.2
TOTAL	546.1	489.5	479.7	518.6	559.6	600.7	615.9	606.0	566.8	583.4

[r]-Revised.

SOURCE: U.S. Department of Commerce.

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U.S. SALES/SHIPMENTS

OTHER ELECTRONIC SYSTEMS & EQUIPMENT

TABLE 5-7

U.S. Factory Shipments ($ Millions): 1982 - 1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Amplifiers (except audio, RF powerand video)	55.1	57.6	62.4	53.0	20.1	39.5	37.2	30.5	31.2	43.4
Electronic games, arcade (except coin-operated) Includes home types prior to 1982	919.9	479.9	283.7	159.8	180.1	258.8	192.4	335.6	261.1	259.2
Automatic garage door openers, electronic	137.3	186.9	197.8	184.4	202.9	232.7	264.6	252.3	257.3	266.9
Ultrasonic equipment: cleaners, drills, solderers and welders	86.4	107.0	127.2	114.2	136.5	93.5	101.3	275.4	217.5	227.4
Trainers and simulators	622.1	770.7	766.9	895.1	969.7	1,112.5	1,156.4	1,303.0	1,157.7	1,350.8
Teaching machines and teaching aids	87.2	21.3	64.3	66.9	34.8	50.6	87.2	56.6	51.2	52.1
Particle accelerator electronic equipment	47.4	33.9	29.1	19.4	14.8	26.2	26.6	na	na	11.0
Scientific electronic equipment, n.e.c.	211.2	184.8	186.9	120.7	115.9	143.7	126.3	125.8	101.9	107.5
Laser systems and equipment, except communication	507.8	545.2	622.8	684.5	766.0	879.3	894.7	915.6	984.6	972.4
Electronic kits to be assembled by purchaser including computers, receivers, transceivers, transmitter-receivers, amateur equipment, and testing and measuring equipment	292.1	193.8	278.8	na	na	22.5	na	na	na	na
Other electronic systems, equipment, and subassemblies, n.e.c.	902.5	831.3	886.4	1,072.9	1,040.2	937.7	938.4	934.3	969.7	963.5
Industrial blank media and parts	na	na	254.5	254.6	342.6	463.6	634.5	588.3	489.6	472.4
Other industrial related	na	na	904.2	904.6	896.7	977.7	1,128.3	1,174.0	1,232.0	1,193.5
TOTAL	3,869.0	3,412.4	4,665.0	4,530.1	4,720.4	5,238.3	5,587.9	5,991.5	5,753.7	5,920.0

na- Not available.
SOURCE: U.S. Department of Commerce.

U.S. SALES/SHIPMENTS

ELECTROMEDICAL EQUIPMENT — **TABLE 5-8**

U.S. Factory Shipments ($ Millions); 1983- 1992

	1983	1984	1985	1986	1987	1988	1989	1990r	1991r	1992
ELECTROMEDICAL EQUIPMENT										
Diagnostic, Therapeutic, Monitoring and Support Equipment	3,301.1	3,390.5	3,352.3	3,324.8	4,004.5	4,596.2	4,594.2	4,848.6	5,459.7	na
Irradiation Equipment	1,543.6	1,757.6	1,675.4	1,606.3	1,571.1	1,418.7	1,745.2	1,870.4	2,110.4	na
TOTAL	4,844.7	5,148.1	5,027.7	4,931.1	5,575.6	6,014.9	6,339.4	6,719.0	7,570.1	7,839e

r-Revised
e-Estimate
na-Not Available
SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department

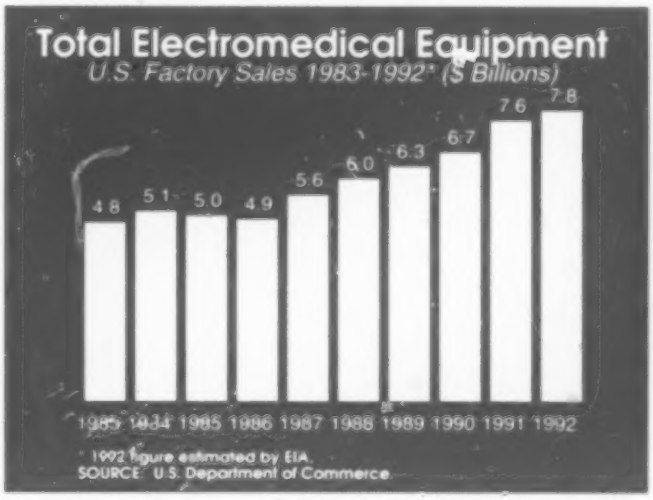
ELECTROMEDICAL EQUIPMENT

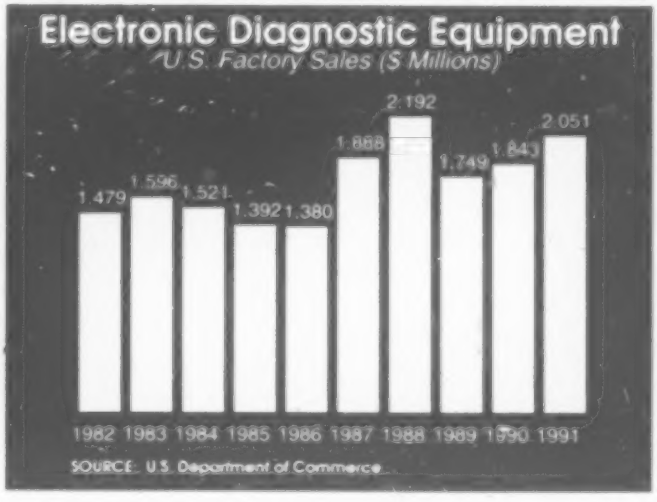
U.S. factory shipments in the electromedical equipment sector grew 3.6% in 1992 to an estimated $7.8 billion -- historically slow growth for an industry which averaged annual gains of 8-9% in the prior 5 years. The industry is comprised of two main sectors, x-ray apparatus and tubes, and diagnostic, therapeutic, and monitoring equipment. The industry employed over 45,000 in 1992, up 4.1% from the prior year.

The electromedical industry is a prime beneficiary of the miniaturization of electronics products. The trend towards smaller and more compact devices has made electromedical equipment more affordable, and accessible, bringing it out of the hospital and into the offices of physicians and smaller clinics. Increased miniaturization has also made it possible for these life-saving devices to be carried in ambulatory units.

The largest sector of the industry is diagnostic equipment, accounting for sales of $2.1 billion in 1991. Many individuals are familiar with the EKG or heart monitor, and ultrasonic devices which provide real time pictures of the inner workings of the human body. A fast growing segment of the diagnostic equipment industry is magnetic resonance imagers. These devices use magnetic fields to map the human body, providing images of amazing clarity which can be instantly analyzed by physicians.

Sales of therapeutic equipment reached $1.5 billion in 1991, with pacemakers accounting for the majority of sales, $821 million. Electrosurgical devices such as tiny fiber optic lasers, are also experiencing sharp sales increases. In 1991, sales of electrosurgical therapeutic equipment totaled $168 million, up 13% from the prior year.





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U.S. SALES/SHIPMENTS

ELECTROMEDICAL EQUIPMENT

Table 5-9

U.S. Factory Shipments ($ Millions): 1982 - 1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990r	1991r
DIAGNOSTIC, THERAPEUTIC, MONITORING AND SUPPORT EQUIPMENT										
Diagnostic Equipment:										
ECGs	88.2	72.3	117.6	78.1	73.3	85.1	98.5	173.0	176.5	185.4
EEGs and EMGs	14.8	14.5	19.6		0.9	2.9		20.1	23.6	31.9
Ultrasonic scanning devices	299.5	376.3	294.2	171.9	243.9	336.6	416.8	566.7	659.6	680.2
Audiological equipment	72.4	10.2	11.5	12.3	13.6	22.5	17.6	22.8	21.6	23.7
Endoscopic equipment		3.0	10.2	10.6	25.5	35.2	22.3	12.3	17.1	24.1
Respiratory analysis equipment	17.7	15.6	17.1				22.7	41.2	36.2	34.3
Automated blood and body fluid analyzers	641.1	744.3	715.3	631.9	571.6	617.2	579.2	na	na	na
Nuclear magnetic resonance imaging devices			81.2	210.9	250.4	466.0	577.0	640.2	633.2	741.9
Other diagnostic equipment	345.4	360.0	254.1	275.8	201.1	322.8	457.7	272.3	274.6	329.9
Therapeutic Equipment:										
Pacemakers	319.1	263.5	370.6	293.5	345.1	284.3	496.8	573.5	726.3	821.3
Defibrillators	80.1	85.6	90.7	103.6	118.3	141.3				
Electrosurgical equipment	23.1	63.6	80.5	80.2	100.8	125.2	133.9	135.3	148.0	167.6
Diathermy apparatus and dialyzers	32.6	72.6	65.5	88.9	85.2	94.6	134.6	151.4	147.4	179.5
Ultrasonic therapeutic equipment	9.4	17.9	31.7	27.1	26.0	35.3	30.2	31.3	35.9	36.8
Other therapeutic equipment	241.3	274.4	280.3	224.7	154.1	190.6	233.7	258.5	280.1	313.3
Patient Monitoring Equipment:										
Intensive/coronary care units	271.9	298.1	280.2	352.2	301.7	283.8		379.8	408.0	467.8
Perinatal monitoring equipment							367.9			
Respiratory monitoring equipment	42.6	70.9	50.9	64.2	67.7	95.6	23.0	82.7	79.0	75.3
Other patient monitoring equipment	289.9	289.7	245.7	248.2	228.7	252.4	255.0	311.2	310.1	331.0
SURGICAL SUPPORT SYSTEMS	108.1	103.7	129.5	177.4	216.9	226.7	273.4	392.2	377.7	461.9
PARTS AND ACCESSORIES FOR ABOVE	162.9	164.9	244.1	300.8	300.0	386.4	455.9	529.6	493.7	553.7
IRRADIATION EQUIPMENT										
Medical X-ray equipment:										
Diagnostic										
Digital radiography			59.9	31.2	39.1	29.4	38.5			
Computerized axial tomography	972.1	1,135.3						320.1	369.5	444.8
Other			666.4	528.7	905.3	815.8	704.1	605.2	633.0	774.4
Therapeutic	64.9	66.8	420.3	429.7						
Dental X-ray equipment	26.9	17.0	96.5	105.7	115.8	131.6	na	206.9	234.8	247.9
Industrial and scientific X-ray equipment	38.1	65.4	37.9	45.4	33.4	16.9	na			
X-ray equipment accessories	70.7	98.5	52.5	61.0	66.0	71.0	82.0	93.5	95.5	93.7
X-ray tubes	70.5	81.2	137.9	158.5	118.3	117.7	111.1	153.0	185.0	193.1
Parts for X-ray equipment	15.0	22.0	158.6	170.9	195.2	218.4	237.9	258.5	247.6	254.9
Other irradiation equipment	82.8	57.4	26.4	50.2	49.1	34.5	67.7	77.8	71.5	76.2
			101.2	94.1	84.1	135.8	177.4	30.2	33.5	25.4
TOTAL	4,402.1	4,844.7	5,148.1	5,027.7	4,931.1	5,575.6	6,014.9	6,339.4	6,719.0	7,570.1

r-Revised.
na-Not Available.
SOURCE: U.S. Department of Commerce.

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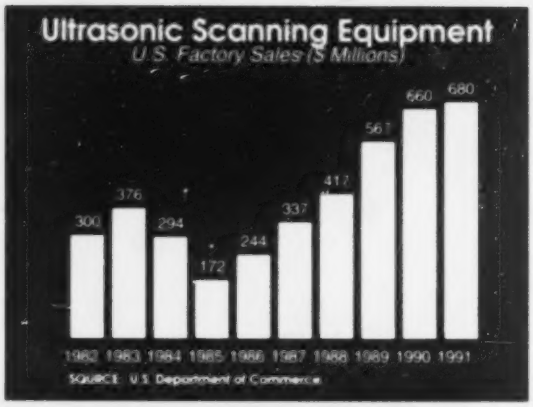
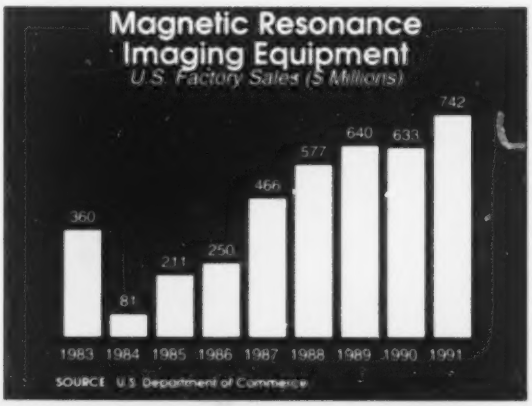
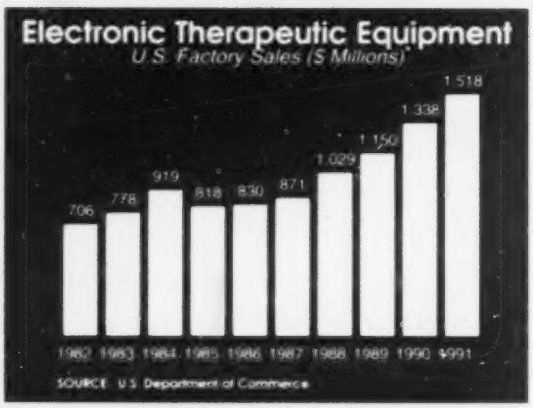
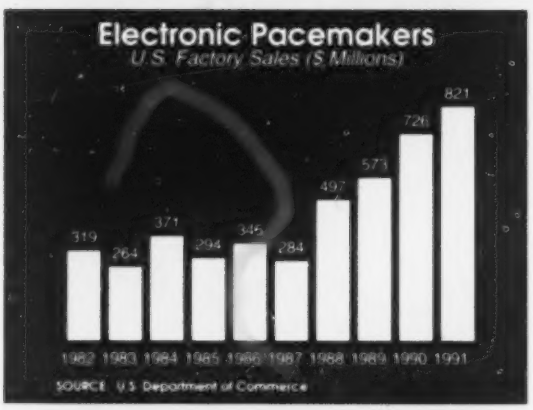
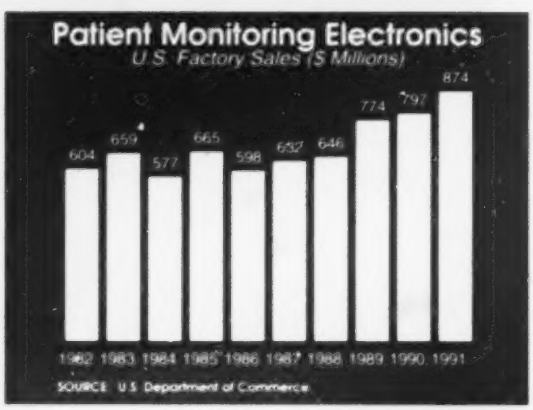
U.S. SALES/SHIPMENTS

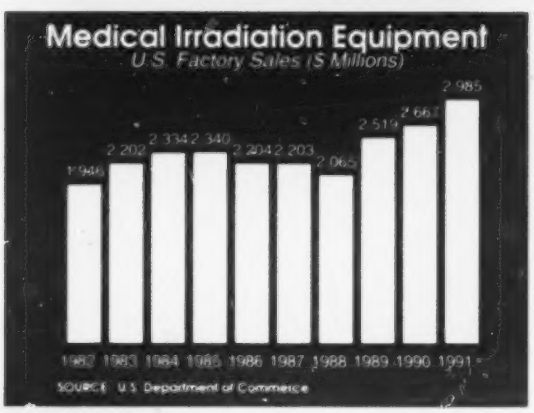


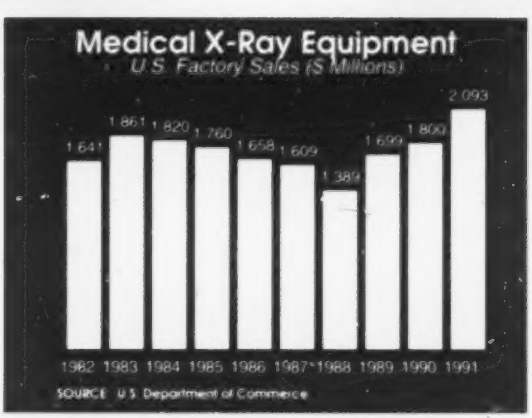












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TRADE TRENDS

INDUSTRIAL ELECTRONICS TRADE

Manufacturers operating in the U.S. hold a strong competitive edge in many industrial electronics technologies, as evidenced by the sizeable trade surplus accumulated in 1992. Exports of industrial electronics reached more than $7.5 billion in 1992 compared to imports of $3.1 billion. Although exports were down form 1991, most of the small decline is due to sluggish economic growth in Europe and Japan.

Exports of industrial electronics accounted for 29% of U.S. factory shipments in 1992, off slightly from 1991, but well above the 23% of sales recorded in 1990. Exports to major European nations, Canada, and Japan accounted for nearly 50% of total exports in 1992, but the U.S. is also a major supplier to the rest of the world.

U.S. imports of industrial electronics are predominantly from four countries: Japan, Canada, the U.K., and Germany. These four countries combined, supplied 62%, or $2 billion of total U.S. imports of industrial electronics products in 1992.

Manufacturers operating in the U.S. hold a strong competitive edge in many of these technologies...

INDUSTRIAL ELECTRONICS Table 5-10
U.S. Exports ($ Millions), 1990-1992

CATEGORY	1990	1991	1992
Industrial Robots	65	79	80
Testing/Analyzing Equipment	1,675	2,108	2,092
Measuring/Analyzing Equipment	2,387	2,359	2,444
Process/Control Devices	717	738	662
Other Electronic Machinery	934	2,308	2,302
TOTAL	6,056	7,557	7,511

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

INDUSTRIAL ELECTRONICS Table 5-11
U.S. Imports & Exports ($ Millions), 1990-1992

	1990	1991	1992
Imports	2,444	3,015	3,143
Exports	6,056	7,557	7,511
Balance of Trade	3,612	4,542	4,368

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

INDUSTRIAL ELECTRONICS Table 5-12
U.S. Imports ($ Millions), 1990-1992

CATEGORY	1990	1991	1992
Industrial Robots	121	167	145
Testing/Analyzing Equipment	528	555	579
Measuring/Analyzing Equipment	817	801	817
Process/Control Devices	340	339	376
Other Electronic Machinery	636	1,224	1,348
TOTAL	2,444	3,015	3,143

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

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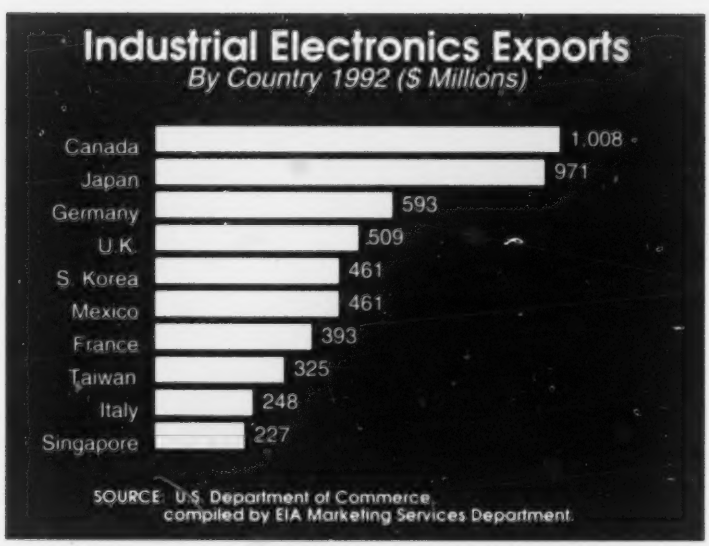
TRADE TRENDS

INDUSTRIAL ELECTRONICS EQUIPMENT **Table 5-13**

U.S. Bilateral Trade ($ Thousands), 1992

IMPORTS		% of Total	EXPORTS		% of Total
Japan	834,468	25.6%	Canada	1,008,439	13.3%
Canada	417,828	12.8%	Japan	971,316	12.8%
U.K.	398,850	12.2%	Germany	593,380	7.8%
Germany	374,341	11.5%	U.K.	509,086	6.7%
Mexico	178,964	5.5%	S. Korea	461,385	6.1%
France	121,627	3.7%	Mexico	461,078	6.1%
Switzerland	88,040	2.7%	France	393,480	5.2%
Netherlands	79,420	2.4%	Taiwan	325,113	4.3%
Taiwan	63,217	1.9%	Italy	247,617	3.3%
Sweden	55,062	1.7%	Singapore	227,450	3.0%
Other	652,830	20.0%	Other	2,381,784	31.4%
TOTAL	3,264,647	100.0%	TOTAL	7,580,128	100.0%

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.



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TRADE TRENDS

ELECTROMEDICAL EQUIPMENT TRADE

U.S. exports of electromedical equipment jumped 12% to $3.4 billion in 1992, while imports were up just 1%. The result was a 42% increase in the trade surplus for this industry. Germany and Japan were the top-two export markets, respectively, for U.S.-made electromedical devices, purchasing a combined $951 million, or 28% of total exports in 1992. Japan ranks as the top source of U.S. electromedical equipment imports with 31% of total imports.

U.S. Exports of electromedical equipment jumped 12% to $3.4 billion in 1992...

ELECTROMEDICAL EQUIPMENT Table 5-14
U.S. Exports ($ Millions), 1990-1992

CATEGORY	1990	1991	1992
Diagnostic/Monitoring Equipment	1,954	2,250	2,530
X-Ray and Related Equipment	634	786	859
TOTAL	2,587	3,036	3,389

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

ELECTROMEDICAL EQUIPMENT Table 5-15
U.S. Imports & Exports ($ Millions), 1990-1992

	1990	1991	1992
Imports	2,000	2,246	2,270
Exports	2,587	3,036	3,389
Balance of Trade	587	790	1,119

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

ELECTROMEDICAL EQUIPMENT Table 5-16
U.S. Imports ($ Millions), 1990-1992

CATEGORY	1990	1991	1992
Diagnostic/Monitoring Equipment	1,691	1,258	1,255
X-Ray and Related Equipment	309	989	1,016
TOTAL	2,000	2,246	2,270

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

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TRADE TRENDS

ELECTROMEDICAL EQUIPMENT

Table 5-17

U.S. Bilateral Trade ($ Thousands), 1992

IMPORTS		% of Total	EXPORTS		% of Total
Japan	707,340	31.2%	Germany	494,491	14.6%
Germany	676,394	29.8%	Japan	456,483	13.5%
Netherlands	175,750	7.7%	Canada	283,608	8.4%
France	139,945	6.2%	Netherlands	271,184	8.0%
Mexico	100,341	4.4%	France	192,029	5.7%
U.K.	88,261	3.9%	U.K.	178,181	5.3%
Israel	36,826	1.6%	Mexico	128,015	3.8%
Ireland	32,473	1.4%	Italy	126,531	3.7%
Canada	32,006	1.4%	Australia	109,198	3.2%
Italy	31,736	1.4%	Belgium	92,093	2.7%
Other	249,134	11.0%	Other	1,056,233	31.2%
TOTAL	2,270,206	100.0%	TOTAL	3,388,046	100.0%

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

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INDUSTRIAL ELECTRONICS

Table 5-18

U.S. Historical Macroeconomic Data (Millions of Dollars), 1990-1992

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
FACTORY SALES													
1990	2,012	2,146	2,346	2,046	2,256	2,383	1,952	2,150	2,368	2,258	2,197	2,068	26,183
1991	1,899	2,069	2,212	2,027	2,070	2,362	1,882	2,088	2,368	2,184	2,218	2,208	25,587
1992	1,932	2,062	2,367	2,064	2,093	2,385	1,926	2,129	2,443	2,234	2,207	2,288	26,130
NEW ORDERS													
1990	2,051	2,239	2,282	2,113	2,196	2,322	1,966	2,198	2,284	2,268	2,062	2,256	26,238
1991	1,901	2,266	2,127	2,108	2,063	2,112	1,968	2,025	2,253	2,166	2,198	2,262	25,450
1992	2,343	2,198	2,205	2,346	2,354	2,443	2,499	2,625	2,751	2,897	2,943	3,408	31,011
INVENTORY													
1990	5,088	5,150	5,190	5,198	5,188	5,140	5,172	5,166	5,060	5,108	5,096	4,962	5,127
1991	4,953	4,979	4,975	4,985	4,994	4,919	4,875	4,878	4,808	4,771	4,745	4,630	4,876
1992	4,403	4,235	4,029	3,857	3,711	3,570	3,468	3,381	3,318	3,252	3,167	3,084	3,623

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
IMPORTS													
1990	176	211	209	182	196	208	217	193	198	246	214	194	2,444
1991	248	264	277	247	244	217	228	242	259	279	239	271	3,015
1992	171	211	263	212	264	280	273	263	279	311	313	303	3,143
EXPORTS													
1990	455	457	569	457	481	537	508	505	509	553	485	541	6,056
1991	614	650	698	609	628	669	586	610	656	620	623	594	7,557
1992	557	600	658	575	640	706	609	567	656	650	644	649	7,511

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Avg.
FINISHED EQUIPMENT FACTORY PRICE INDEX (12/90=100)													
1990	98.7	99.0	99.0	99.1	99.3	99.7	99.7	99.8	99.8	100.1	100.6	100.1	99.6
1991	101.0	101.1	101.0	101.4	101.2	102.0	101.8	102.2	102.1	102.9	102.8	103.0	101.9
1992	102.5	102.8	102.8	103.1	103.6	103.3	103.1	103.0	103.2	104.1	104.3	104.4	103.3

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Avg.
EIA INDUSTRIAL ELECTRONICS STOCK INDEX (1/91=100)													
1991	100.00	107.81	108.98	110.34	118.03	118.38	120.98	123.26	123.51	128.25	120.86	129.14	117.46
1992	136.62	137.61	131.74	129.38	126.19	114.09	115.09	119.74	123.23	123.77	125.18	130.20	126.07

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Deparment.

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ECONOMIC OVERVIEW

INDUSTRIAL ELECTRONICS **Table 5-19**

U.S. Employment (Thousands of Workers), 1988-1992

	1988	1989	1990	1991	1992
All Employees	269.0	268.7	259.9	248.3	233.6
Production Workers	145.3	146.2	139.6	130.9	118.7
Women Employees	111.4	111.3	107.6	102.8	96.7
Wage Index (12/88=100)	100.6	104.1	107.9	113.4	118.3

SOURCE: U.S. Department of Labor, compiled by EIA Marketing Services Department.

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ELECTROMEDICAL EQUIPMENT

Table 5-20

U.S. Historical Macroeconomic Data (Millions of Dollars), 1990-1992

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
FACTORY SALES													
1990	501	538	574	529	563	594	537	566	598	571	575	572	6,719
1991	598	631	615	613	628	650	613	611	675	636	635	664	7,570
1992	604	641	686	643	637	712	609	620	710	630	630	716	7,839
NEW ORDERS													
1990	562	567	584	510	535	616	558	553	615	630	551	540	6,822
1991	611	601	603	566	632	588	646	614	687	702	591	560	7,401
1992	608	637	629	625	643	644	619	732	676	747	640	677	7,877
INVENTORY													
1990	1,226	1,244	1,252	1,254	1,263	1,224	1,215	1,272	1,258	1,279	1,275	1,241	1,250
1991	1,301	1,314	1,318	1,331	1,344	1,339	1,346	1,347	1,346	1,377	1,387	1,344	1,341
1992	1,360	1,377	1,364	1,385	1,402	1,395	1,408	1,419	1,411	1,432	1,438	1,399	1,399

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
IMPORTS													
1990	117	141	163	145	154	158	194	179	183	188	183	195	2,000
1991	159	163	203	185	177	194	215	187	184	199	176	204	2,246
1992	170	175	209	177	161	186	202	191	207	185	185	223	2,270
EXPORTS													
1990	206	192	235	228	209	223	198	195	214	221	223	243	2,587
1991	231	230	263	254	249	265	240	230	255	273	279	267	3,036
1992	260	278	291	271	290	284	278	271	284	309	274	299	3,389

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Avg.
FINISHED EQUIPMENT FACTORY PRICE INDEX (12/90=100)													
1990	97.9	98.0	98.6	98.6	99.0	99.3	98.8	99.2	99.8	100.0	99.9	100.0	99.1
1991	100.3	100.2	100.1	100.4	100.3	100.6	100.7	101.0	100.9	101.1	101.4	101.3	100.7
1992	101.1	101.3	101.2	101.2	102.5	102.7	102.6	102.4	102.4	102.4	102.1	102.1	102.0

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Deparment.

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ECONOMIC OVERVIEW

ELECTROMEDICAL EQUIPMENT

Table 5-21

U.S. Employment (Thousands of Workers), 1988-1992

	1988	1989	1990	1991	1992
All Employees	33.2	38.1	39.9	43.4	45.1
Production Workers	17.6	19.7	20.0	17.5	18.0
Women Employees	16.9	19.5	20.3	22.1	23.0
Wage Index (12/88=100)	100.3	102.7	105.7	113.8	120.8

SOURCE: U.S. Department of Labor, compiled by EIA Marketing Services Department.

RELAYS AND INDUSTRIAL CONTROLS (SIC Code 3625)

Table 5-22

U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
Wisconsin	8,092	12.9
Illinois	6,722	10.7
North Carolina	5,037	8.0
New York	4,471	7.1
California	3,932	6.2
TOTAL	62,913	100.0

Note: Additional detail on employment is available from the EIA Research Center. Please see front inside cover for details.

PROCESS CONTROL INSTRUMENTS (SIC Code 3823)

Table 5-23

U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
California	9,526	15.3
Massachusetts	7,741	12.4
Pennsylvania	6,882	11.1
Texas	4,193	6.7
Ohio	3,720	6.0
TOTAL	62,259	100.0

SOURCE: Employment and Wages Annual Averages, 1991, U.S. Department of Labor, Bureau of Labor Statistics.

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ECONOMIC OVERVIEW

INSTRUMENTS TO MEASURE ELECTRICITY (SIC Code 3825) Table 5-24
U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
California	35,245	41.3
Colorado	4,889	5.7
Massachusetts	4,815	5.6
Washington	3,808	4.5
New York	2,791	3.3
TOTAL	85,313	100.0

SOURCE: Employment and Wages Annual Averages, 1991, U.S. Department of Labor, Bureau of Labor Statistics.

MEASURING & CONTROLLING DEVICES, NEC (SIC CODE 3829) Table 5-25
U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
Minnesota	5,380	12.0
California	5,115	11.4
New York	3,521	7.9
Pennsylvania	3,281	7.3
Connecticut	2,707	6.0
TOTAL	44,775	100.0

NEC - Not elsewhere classified.
SOURCE: Employment and Wages Annual Averages, 1991, U.S. Department of Labor, Bureau of Labor Statistics.

X-RAY APPARATUS AND TUBES (SIC Code 3844) Table 5-26
U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
Wisconsin	4,011	35.1
California	1,763	15.4
Illinois	925	8.1
New York	493	4.3
Massachusetts	461	4.0
TOTAL	11,420	100.0

SOURCE: Employment and Wages Annual Averages, 1991, U.S. Department of Labor, Bureau of Labor Statistics.

ELECTROMEDICAL EQUIPMENT (SIC Code 3845) Table 5-27
U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

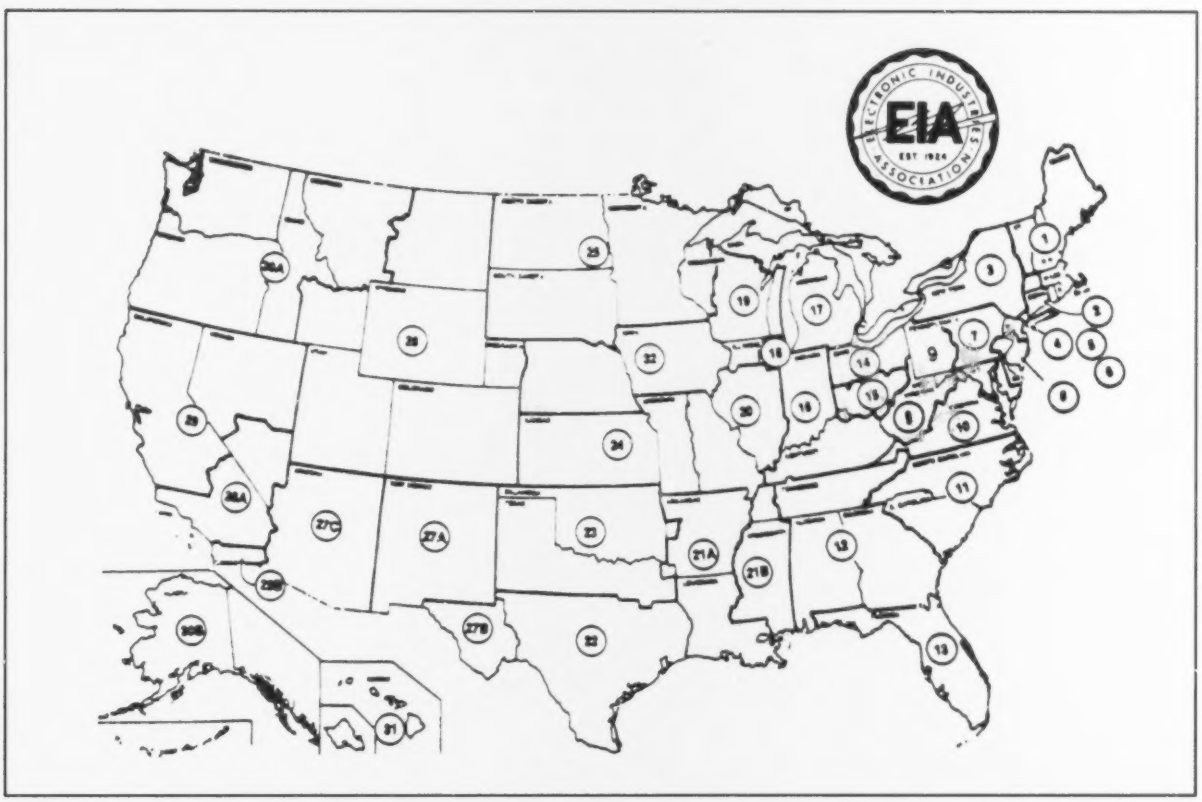
	Employment	% of Total
Minnesota	4,613	14.4
California	4,598	14.4
Texas	3,533	11.0
Massachusetts	2,856	8.9
New York	1,363	4.3
TOTAL	32,023	100.0

SOURCE: Employment and Wages Annual Averages, 1991, U.S. Department of Labor, Bureau of Labor Statistics.

UNIT TERRITORY PLAN

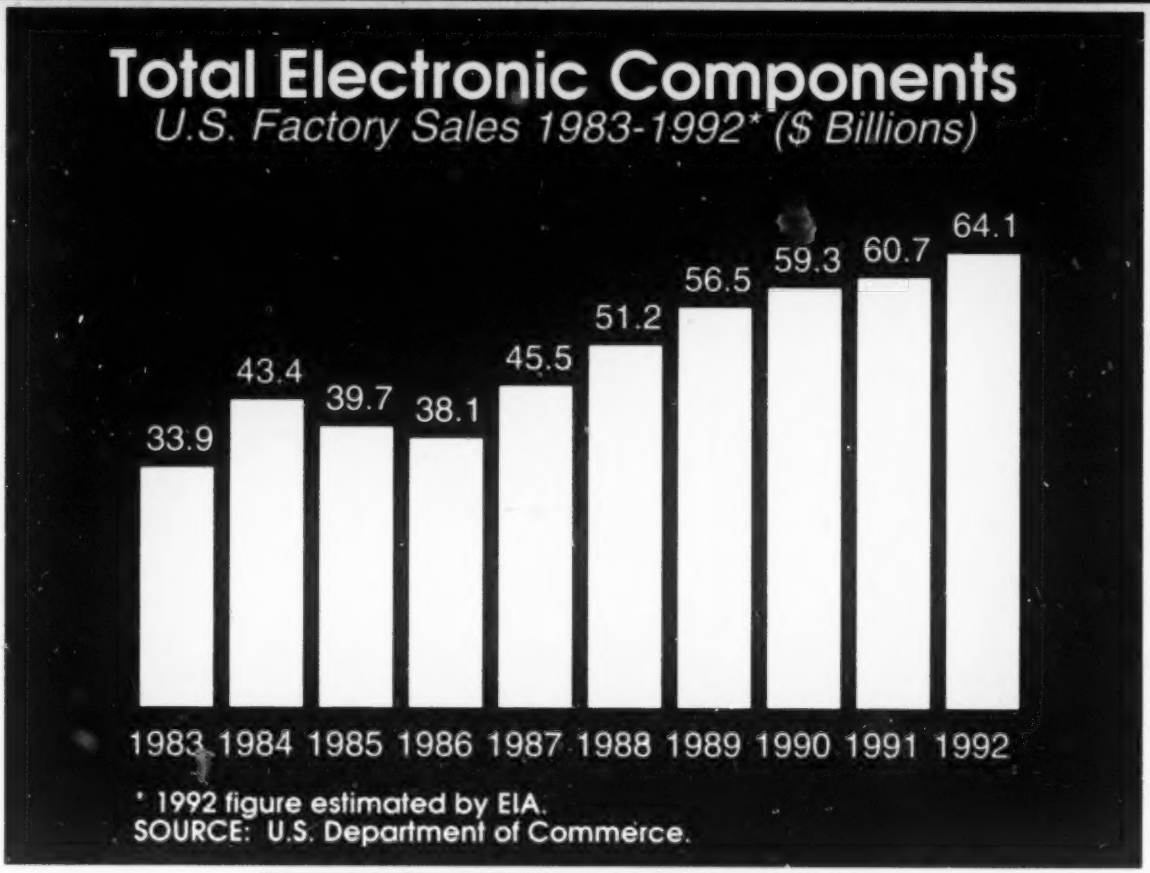
The Unit Territory Plan was first published over thirty five years ago in recognition of the importance of making intelligently devised sales territories available to manufacturers whose sales are handled, at least in part, through independent representatives. Today, the UTP has found wider application within various industry sectors, and, in these challenging times when "efficiencies" are emphasized, its value continues to grow.

Containing statistical information compiled from EIA's report on "Sales of Electronic Components by Geographic Area", the Unit Territory Plan provides valuable sales data by zip code, by state, and by territory.



For further information or to order a UTP booklet and map, contact: EIA's Components Group, 2001 Pennsylvania Avenue, N.W., Washington, DC 20006; 202/457-4930.

6: ELECTRONIC COMPONENTS



IN THIS CHAPTER

- ***Electron Tubes***
- ***Passive Components***
- ***Integrated Circuits***
- ***Flash Memory***
- ***Multichip Modules***
- ***Solid State***
- ***Capacitors***
- ***Resistors***
- ***Connectors***
- ***Other Components***

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U.S. SALES/SHIPMENTS

ELECTRONIC COMPONENTS U.S. FACTORY SALES

Total U.S. factory sales of electronic components reached an estimated $64.1 billion in 1992, up 6% over 1991 (see graph). The industry is made up of many distinct sectors such as semiconductors, connectors, capacitors, resistors, printed circuit boards, and others. U.S. electronic component manufacturers employ some 595,000 workers, or 33% of total U.S. electronic employment.

Semiconductors chalked up sales of $25.9 billion in 1991. Integrated circuits, which include microprocessors, memory chips and others, accounted for the bulk of semiconductor sales totaling $19.1 billion in 1991.

ELECTRONIC COMPONENTS Table 6-1

U.S. Factory Shipments ($ Millions); 1983-1992

	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]	1992
ELECTRON TUBES										
Receiving Tubes[r]	56	45	45	40	44	35	21	24	22	
Power & Special Purpose Tubes	1,007	1,059	1,061	1,067	1,119	1,171	1,075	1,070	1,023	
TV Tubes	980	1,042	962	1,028	1,029	1,093	1,511	1,552	1,541	
TOTAL-Electron Tubes	2,043	2,146	2,068	2,135	2,192	2,299	2,607	2,646	2,586	na
SOLID STATE PRODUCTS										
Transistors	626	824	655	688	753	864	711	682	686	
Diodes & Rectifiers	736	761	755	686	780	855	748	727	703	
Integrated Circuits	8,861	12,960	10,806	10,816	12,851	14,865	16,142	16,461	19,087	
Other Semiconductors	2,347	2,487	2,434	2,220	2,436	3,206	4,645	5,683	5,443	
TOTAL-Solid State Products	12,570	17,032	14,650	14,410	16,820	19,790	22,246	23,553	25,918	na
PASSIVE AND OTHER COMPONENTS										
Capacitors	1,277	1,619	1,200	1,223	1,411	1,534	1,536	1,412	1,393	
Resistors[r]	763	948	870	863	849	880	812	800	762	
Coils & Transformers	966	1,055	1,179	1,042	1,149	1,183	1,100	976	948	
Connectors	2,586	3,200	2,901	3,026	3,629	3,748	3,593	3,324	3,147	
Switches	512	548	577	537	692	625	644	579	526	
Filters	167	232	178	210	233	190	183	197	173	
Quartz Devices	257	340	338	319	395	381	248	260	257	
Wire & Cable	1,386	1,613	1,475	1,409	1,662	1,772	1,869	1,784	1,628	
Relays	296	552	631	588	596	507	530	558	521	
TV & FM Antennas & Parts[r]	193	150	180	180	150	218	232	241	215	
Other Components[1]	10,919	13,982	13,423	13,121	15,676	18,038	20,869	22,953	22,627	
TOTAL-Passive & Other Components	19,322	24,239	22,952	22,518	26,442	29,076	31,616	33,084	32,197	na
GRAND TOTAL	33,935	43,417	39,670	38,063	45,454	51,165	56,469	59,283	60,701	64,144[e]

[1] Includes sockets, delay lines, loudspeakers, magnetic components, transducers, printed circuit boards, microwave components, assemblies and parts.
[r]-Revised
[e]- Estimated.
na-Not Available.
SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

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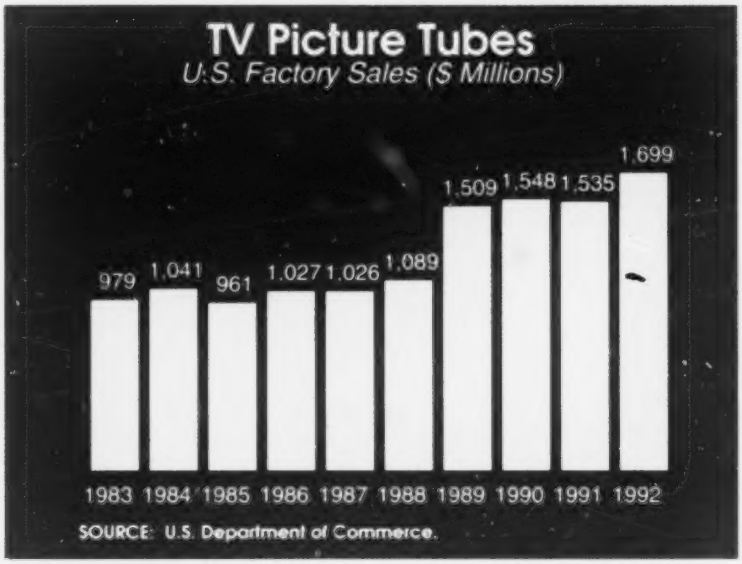
U.S. SALES/SHIPMENTS



TELEVISION PICTURE TUBES BY SCREEN SIZE Table 6-2

U.S. Factory Sales (Thousands of Units and Dollars); 1983-1992[1]

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
COLOR UNITS										
12" & Under	2	2	2							
13"	1,199.1	1,646.5	911.6							
14"	169.6	172.5	77.9							
15"	32.5	42.0	9.3							
16"	0.3	--								
17"	156.0	105.3	30.8							
18"	0.7	3.8	3.4	11,684.3[3]	12,229.43	13,747.43	15,027.23	14,599.73	14,915.83	16,741.53
19"	6,306.4	6,423.0	6,095.0							
20"	6.8	1.3								
21"										
22" and 23"	94.0	43.8								
24" and 25"	3,443.2	3,956.1	4,193.3							
26" and Over	155.9	350.9								
TOTAL (Units)	11,564.5	12,745.2	11,321.3	11,684.3	12,229.4	13,747.4	15,027.2	14,599.7	14,915.8	16,741.5
TOTAL (Dollars)	$978,854	$1,041,374	$961,405	$1,026,687	$1,026,409	$1,088,912	$1,508,595	$1,548,136	$1,535,043	$1,698,664
MONOCHROME[4]										
TOTAL (Units)	10.3	20.0	5.6	16.4	66.4	89.8	28.4	54.1	63.2	61.8
TOTAL (Dollars)	$876	$629	$475	$1,109	$2,624	$4,224	$2,249	$4,327	$6,215	$5,392
GRAND TOTAL (Units)	11,574.8	12,765.2	11,326.9	11,700.7	12,295.8	13,837.2	15,055.6	14,653.8	14,979.0	16,803.3
GRAND TOTAL (Dollars)	$979,730	$1,042,003	$961,880	$1,027,796	$1,029,033	$1,093,136	$1,510,844	$1,552,463	$1,541,258	$1,704,056

[1] Excludes imports and sales by non-reporting rebuilders. Data subsequent to 1985 exclude renewal equipment.
[2] Included in 14".
[3] Color unit data combined after 1985.
[4] Data exclude initial equipment
SOURCE: EIA Marketing Services Department; U.S. Department of Commerce.

U.S. SALES/SHIPMENTS

TELEVISION PICTURE TUBES BY MARKET

Table 6-3

U.S. Factory Sales (Thousands of Units and Dollars); 1983-1992[1]

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
COLOR UNITS										
Initial Equipment	10,737.0	11,975.0	10,719.8	10,810.2	11,716.3	12,152.8	13,387.7	12,402.0	11,924.9	13,243.2
Renewal	337.4	312.2	285.9	na	na	na	na	na	na	na
Export	490.1	458.0	315.6	874.1	513.1	1,594.6	1,639.5	2,197.7	2,990.0	3,498.3
TOTAL (Units)	11,564.5	12,745.2	11,321.3	784.3	12,229.4	13,747.4	15,027.2	14,599.7	14,915.8	16,741.5
TOTAL (Dollars)	978,854	1,041,374	961,405	1,026,687	1,026,409	1,088,912	1,508,595	1,548,136	1,535,043	1,698,664
MONOCHROME UNITS										
TOTAL (Units)	10.3	20.0	5.6	16.4	66.4	89.8	28.4	54.1	63.2	61.8
TOTAL (Dollars)	876	629	475	1,109	2,624	4,224	2,249	4,327	6,215	5,392
GRAND TOTAL (Units)	11,574.8	12,765.2	11,326.9	11,700.7	12,295.5	13,837.2	15,055.6	14,653.8	14,979.0	16,803.3
GRAND TOTAL (Dollars)	979,730	1,042,003	961,880	1,027,796	1,029,033	1,093,136	1,510,844	1,552,463	1,541,258	1,704,056

[1] Excludes imports and sales by non-reporting rebuilders.
na- Not Available.
SOURCE: EIA Marketing Services Department, U.S. Department of Commerce.

POWER AND SPECIAL PURPOSE TUBES

Table 6-4

U.S. Sales[1] *($ Millions); 1983 - 1992*

Category	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
High-vacuum tubes	126	135	114	112	113	122	111	107	102	79
Gas and vapor tubes	32	40	33	41	42	42	41	37	32	41
Klystrons	111	103	92	84	74	76	65	62	67	58
Magnetrons/CFAs[2]	92	85	77	78	85	100	80	82	85	62
Forward and backward wave tubes[2]	271	289	319	347	383	343	289	250	218	117[2]
Electro-optical devices[3]	330	357	371	345	368	445	447	487	475	463
Special purpose tubes[4]	45	50	55	60	54	43	42	45	44	46
TOTAL	1,007	1,059	1,061	1,067	1,119	1,171	1,075	1,070	1,023	926

[1] Excludes R&D Billing.
[2] Backward wave tubes included in Magnetrons/CFAs.
[3] Excludes entertainment TV picture tubes.
[4] Includes radiation detection tubes, reference cavitites; beam deflection tubes; decade counters; mechanical transducers; orbital beam tubes; and vacuum capacitors, switches and relays.
[r] - Revised.
SOURCE: EIA Marketing Services Department.

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U.S. SALES/SHIPMENTS

INTEGRATED MICROCIRCUITS (Semiconductor Networks) **Table 6-5a**

U.S. Factory Shipments ($ Millions); 1983-1991

	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]
Hybrid integrated circuits, thick film composed of material deposited by silk screen process on a passive substrate combined with discrete active or passive components	468.4	639.2	557.7	547.8	600.3	863.1	893.3	789.8	808.1
Hybrid integrated circuits, thin film composed of material deposited by vacuum deposition, sputtering or similar process	261.6	315.9	527.5	520.8	489.8	517.8	463.1	618.3	669.8
Hybrid integrated circuits, multichip, circuits not incorporating film techniques. These are usually combinations of chips, active and/or passive. Discrete package devices may be used for some, but not all of the circuits	81.7	95.4	82.8	79.2	91.8	149.0	112.8	97.0	88.2
Monolithic bipolar integrated circuits:									
TTL (transistor transistor logic)	1,310.8	2,746.1	2,141.6	2,057.4	1,783.3	1,749.3	1,868.6	1,627.6	1,403.7
CML/ECL (current mode logic/emitter coupled logic)	113.4	247.9	287.8	215.3	404.3	280.1	271.1	159.4	155.0
Linear bipolar, excl. microprocessors	na	885.2	1,070.0	1,227.5	1,454.3	1,730.0	1,748.6	1,811.0	1,690.7
Microprocessors	100.8	216.6	66.7	39.6	47.6	53.2	44.4	129.1	107.0
Other bipolar logic	1,221.5	437.1	463.9	243.0	402.1	544.9	403.3	247.9	216.7
Random access memories	na	85.8	77.2	63.1	152.3	97.6	53.4	85.1	56.7
Read only memories	na	20.1	71.9	75.3					
Other bipolar memories	na	211.3	162.5	174.6	114.5	171.9	205.3	176.9	148.8
Other bipolar integrated circuits	na	368.0	368.5	434.9	538.1	348.8	736.4	679.4	576.1
MOS (metal oxide semiconductors)	4,895.6	6,119.1	4,702.8	4,719.9	6,089.7	7,956.4	8,990.1	9,601.7	12,682.5
Other monolithic integrated circuits	406.6	572.4	225.1	417.2	482.4	402.5	351.3	438.1	483.3
TOTAL	8,860.7	12,960.1	10,806.0	10,815.6	12,850.5	14,864.6	16,141.9	16,461.3	19,086.6

[r] Revised.
na-Not Available.
SOURCE: U.S. Department of Commerce.

FLASH MEMORY

Flash semiconductors are used in semiconductor disk drives, a technology that some predict will replace hard drives in portable computers.

"Flash memory" may be crucial in the development of the next generation of smaller and more energy efficient portable computers. There are two types of flash memory: flash electronic programmable memory (EPROM) and flash eraseable electronic programmable memory (EEPROM). Flash memory chips retain information when power is lost or turned off, thus saving data while consuming less power (DRAMs lose information in power loss). Flash memory can also be reprogrammed faster and easier than other types of semiconductors, making them ideally suited for portable equipment applications.

Flash semiconductors are used in semiconductor disk drives, a technology that some predict will replace hard drives in portable computers. Flash semiconductor drives are smaller than conventional hard drives, access data more than 100 times faster than floppy disks, and can handle hostile environments such as humidity, heat, cold, and shock better than conventional disk drives, because they do not have moving parts.

High cost and limited storage capacity have slowed the rise of sales of these drives. Conventional disk drive manufacturers are countering the anticipated competition, however, by shrinking the size of disk drives and increasing their capacity.

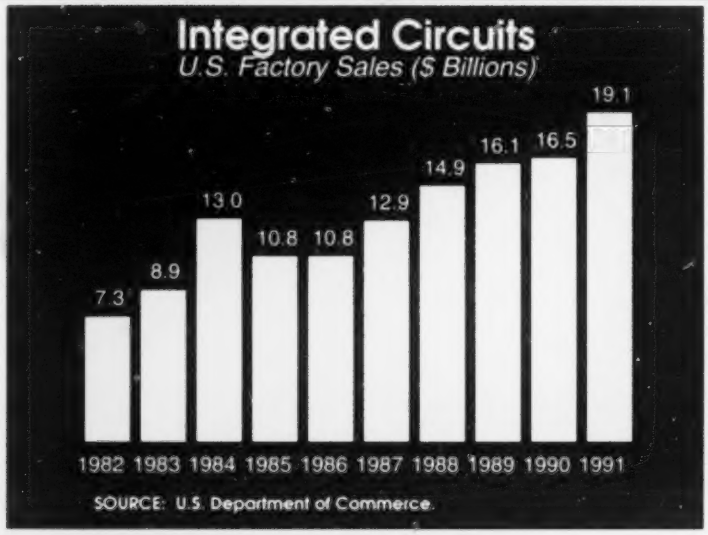
U.S. SALES/SHIPMENTS

Because ASICS are tailored for each user, they have virtually limitless applications including cellular phones, HDTV, music synthesizers, electromedical equipment, and more.

ASICS

One of the fastest growing integrated circuit products is Application Specific Integrated Circuits (ASICs). ASICs are standard integrated circuits (ICs) customized for specific functions. ASIC manufacturers construct complete systems on a single chip, blurring the line between multifunctional microprocessors. They take advantage of the lower cost of standard parts, while offering the higher performance of custom ICs. U.S. and Japanese manufacturers hold nearly equal shares of this segment.

Because ASICS are tailored for each user, they have virtually limitless applications including cellular phones, HDTV, music synthesizers, electromedical equipment, and more. ASICs are also being developed for use in intelligent highways, military mapping, and data compression technology, which will find many uses, not the least of which is HDTV.



MCMs are likely to play a major role in the development of many emerging and future electronics products...

MULTICHIP MODULES

Interest is growing rapidly in the potential of Multichip Modules (MCM). MCMs are likely to play a major role in the development of many emerging and future electronics products, such as HDTV. Other specific downstream technologies such as voice recognition synthesis, image processing, character recognition, multimedia/video processing, and artificial intelligence-based products could also all benefit from the enhanced power and speed potential of MCMs.

Trends toward component miniaturization have renewed interest in the development of MCMs. In general, a MCM is a collection of semiconductor devices packaged much like today's printed circuit boards (PCB). However, MCMs occupy about half the space of a conventional PCB, and require about half the power while operating faster (20 percent higher clock rates) than a single-chip application. In addition, MCMs offer a higher packaging efficiency than other technologies which should lead to even more miniaturization.

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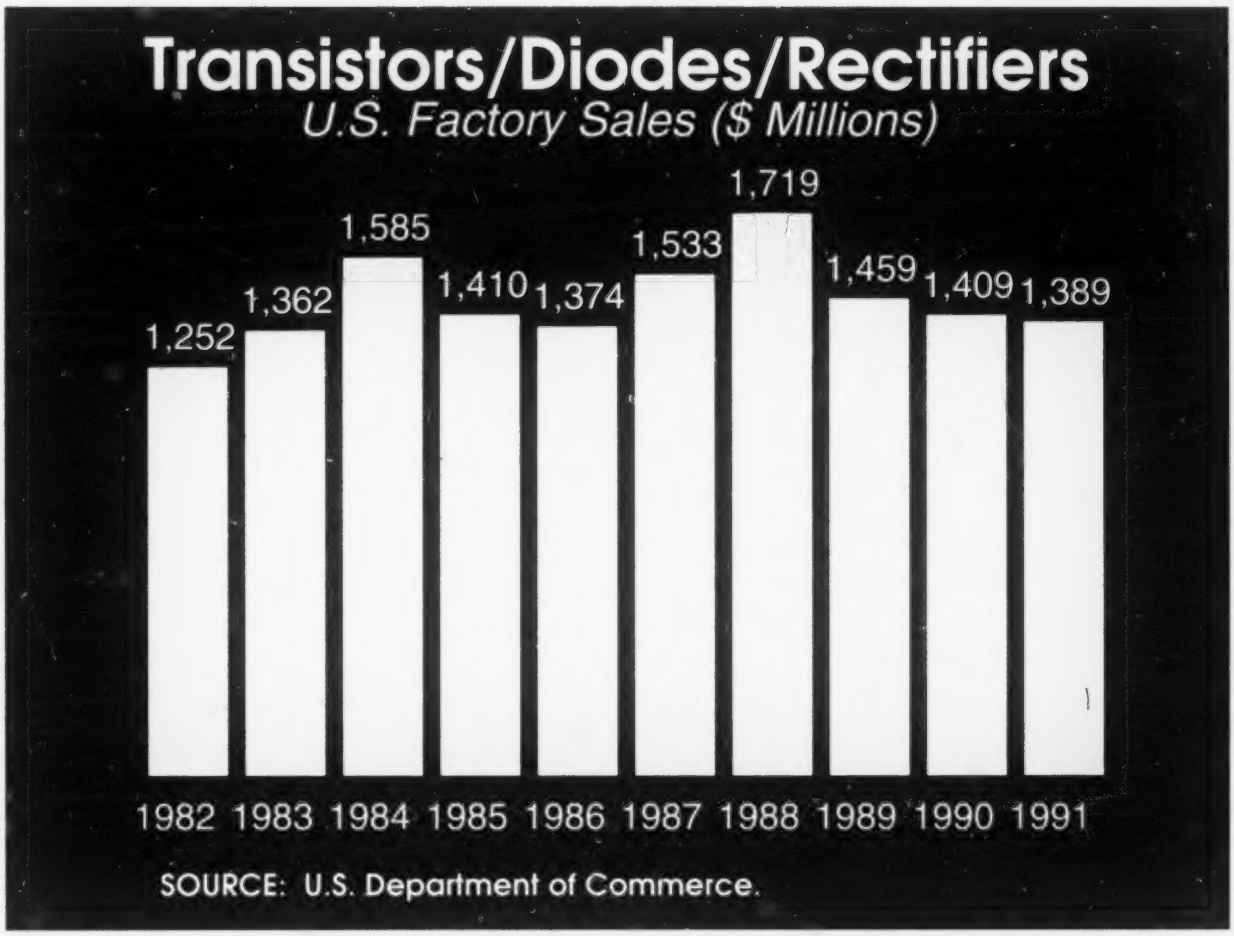
U.S. SALES/SHIPMENTS



U.S. SALES/SHIPMENTS

SOLID STATE PRODUCTS **Table 6-5b**

U.S. Factory Shipments ($ Millions); 1983-1991

	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]
TRANSISTORS									
Signal (less than 1 watt dissipation)	272.5	384.1	263.2	282.9	294.7	335.8	240.8	223.0	228.5
Power (1 watt or greater dissipation)	353.3	439.6	392.1	404.7	458.4	528.3	469.8	449.3	457.0
TOTAL	625.8	823.7	655.3	687.6	753.1	864.1	710.6	682.3	685.6
DIODES AND RECTIFIERS									
Signal diodes and assemblies thereof (maximum current of 0.5 amps)	136.9	162.2	129.0	100.7	110.8	141.8	54.9	49.0	35.1
Semiconductor rectifiers/Power diodes and assemblies thereof (current rating greater than 0.5 amps)	208.7	217.7	323.6	287.2	344.7	362.9	335.2	314.3	288.9
Zener diodes (voltage regulator and voltage reference diodes)	100.4	179.1	140.6	148.9	141.1	166.1	165.5	153.6	141.9
Microwave diodes (mixers, detectors, varactors, parametric, harmonic generators,etc.)	92.3	99.3	110.2	111.5	133.1	131.4	127.4	147.4	153.4
Selenium rectifiers	2.8	3.3	2.8	2.8	3.9	4.7	4.2	4.0	3.5
Light emitting diodes (LED)	195.0	99.1	49.1	34.3	46.4	48.1	61.1	58.4	80.7
TOTAL	736.1	760.7	755.3	685.4	780.0	855.0	748.3	726.6	703.4
OTHER SEMICONDUCTOR DEVICES									
Light sensitive and light emitting devices									
Solar cells	47.8	48.5	33.5	36.6	48.1	47.5	30.8	40.6	37.4
Photodiodes	[1]	10.4	11.3	14.9	26.8	39.0	40.6	59.5	53.1
Optical coupled isolators	[1]	65.9	69.6	73.7	47.9	77.0	83.3	81.9	74.1
Other light sensitive/emitting devices	131.4	188.1	128.6	102.7	99.2	143.4	165.7	205.5	177.9
Thyristors (SCR's, triacs, PNPN diodes)	94.1	126.2	125.4	137.6	108.9	142.6	108.8	131.8	113.8
All other semiconductor devices	245.4	305.8	287.5	282.4	479.0	460.6	554.6	760.0	695.1
Semiconductor devices and circuits "chips" (DICE) and wafers (DISCS)	1,313.5	1,162.4	1,152.7	944.1	1,189.7	1,617.5	2,172.2	2,962.4	3,101.3
All other semiconductor parts (headers, packages, heat sinks, other accessories, etc.)	515.4	579.9	625.5	627.7	436.1	678.7	1,488.9	1,440.9	1,189.9
TOTAL	2,347.6	2,487.2	2,434.1	2,219.7	2,435.7	3,206.3	4,645.0	5,682.6	5,442.6
GRAND TOTAL[2]	12,570.2	17,031.7	14,650.7	14,408.4	16,819.3	19,790.0	22,245.7	23,552.9	25,918.2

[1] Included in "Other light sensitive/emitting devices".
[2] Includes Integrated Microcircuits total from Table 6-5a.
[r] Revised.
SOURCE: U.S. Department of Commerce.

MICROCONTROLLERS

Microcontrollers are finding a wide range of uses from wrist watches to washing machines. One of the major users of microcontroller technology is the automotive industry. These tiny devices can be found controlling anti-lock brake systems and dashboard instrument panels. Microprocessor companies are hard at work developing one-chip processor systems. Some computer companies are even developing their own microprocessors rather than relying on traditional processor suppliers. Other computer companies have entered into alliances with semiconductor manufacturers to develop customized system processors for use in their next-generation computers. MOS microcomponents with system-on-silicon (or system on chip) technology is expected to be the fastest growing segment of the microcomponent industry in the 1990's.

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PASSIVE AND OTHER COMPONENTS

Passive and other components registered factory sales of $32.2 billion in 1991, down slightly from 1990. The passives industry is dominated by change. The transition to surface mounted devices and passive network products, such as resistor networks, as well as smaller multilayer capacitors, continues to key developments in the passive components industry.

A major product of the passive components industry are printed circuit boards (PCBs). The computer market is the major consumer of PCB products; 43.4% of overall production went into computer manufacturing in 1991. Telecommunications products are the second major market with 17.3% of PCB output. OEM PCB makers place an even greater emphasis on computer applications, accounting for 47% of their sales in 1991.

Multilayer boards have become the dominant product in the industry.

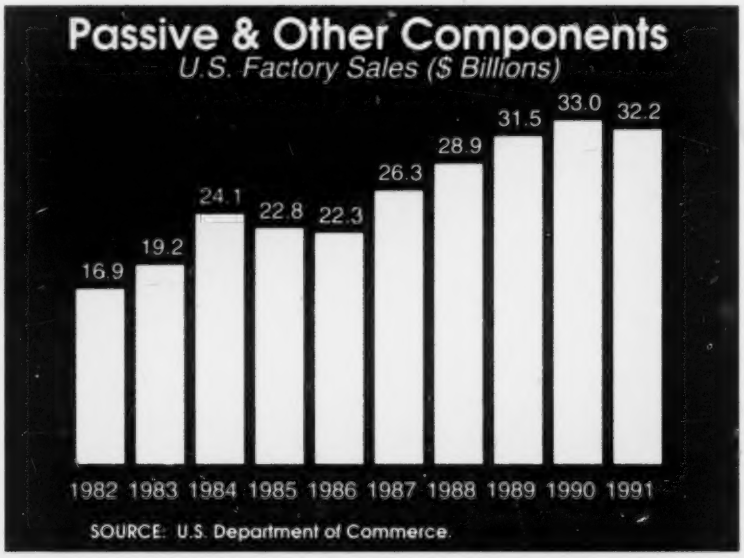
The transition toward surface mount technology is strongly evident in the PCB assembly process. Currently, more than half of all PCBs are assembled with a least one or more surface mount components. The percentage of assemblies with surface mounted components rose sharply in 1990 to 55.1%, compared with 11.8 percent in 1989.

Multilayer boards have become the dominant product in the industry, continuing the transition from single-sided or double-sided boards during the last 10 years. Use of multilayer boards has grown 103% between 1982 to 1992 according to the Institute for Interconnecting and Packaging.

...demand for higher performance, more functionality, and continued miniaturization at competitive prices is driving the continued trend toward surface mount technology (SMT)...

The demand for higher performance, more functionality, and continued miniaturization at competitive prices is driving the continued trend toward increased circuit density and surface mount technology (SMT) products, as contrasted with conventional through-the-hole mounting of components.

During the period 1990-96, SMT applications are expected to rise to $4.6 billion annually according to U.S. Government figures; growth rates of between 15 to 20% per year are forecast during this period. Surface mount devices reduce assembly time by up to 80% over through-hole component mounting. In 1992, surface mounted devices (SMDs) represented an estimated 60% of the U.S. market for components.



U.S. SALES/SHIPMENTS

CAPACITORS

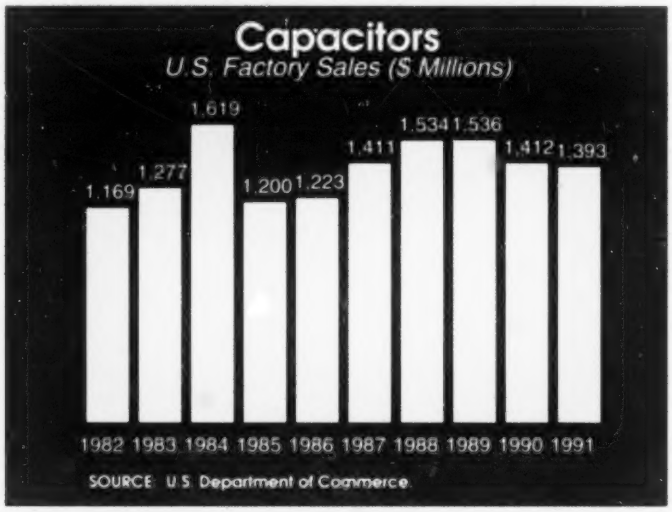
Table 6-6

U.S. Factory Sales (Millions of Units and Dollars); 1991-1992 [1]

	1991		1992	
	Units	Dollars	Units	Dollars
Paper & Film Dielectric	452.4	229.1	472.9	233.2
Tantalum Electrolytic	1,578.8	350.1	1,991.7	379.8
Aluminum Electrolytic	117.9	123.0	128.4	126.1
Ceramic Dielectric, Fixed	17,480.3	629.1	21,826.9	720.1
Other[2]	141.2	62.0	59.0	32.2
TOTAL	19,770.6	1,393.3	24,478.9	1,491.4

[1] Includes factory sales and imports by U.S. manufacturers.
[2] Other includes mica, all other fixed types, and variables.
SOURCE: EIA Marketing Services Department.

Trends in the capacitor industry are toward surface mounting, and the miniaturization of multilayer capacitor chips.



CAPACITORS

Table 6-7

U.S. Factory Sales ($ Millions); 1983-1992 [1]

Year	Paper and Film	Tantalum	Aluminum	Mica	Ceramic	Other[4]	Variable	Total
1983	248	328	164	na	504	14	19	1,277
1984	314	413	189	na	670	16	17	1,619
1985	257	307	140	na	465	16	15	1,200
1986	263	302	131	na	493	15	19	1,223
1987	281	334	138	76[3]	546	14	22	1,411
1988	285	380	148	[2]	607	114	[2]	1,534
1989	281	350	147	[2]	631	127	[2]	1,536
1990	246	336	150	[2]	626	54	[2]	1,412
1991	229	350	123	[2]	629	62	[2]	1,393
1992	233	380	126	[2]	720	32	na	1,491

[1] Includes factory sales and imports by U.S. manufacturers.
[2] Combined with Other.
[3] Includes ceramic microwave, other ceramic and other aluminum.
[4] In 1988 and 1989, Other includes ceramic microwave, other ceramic, other aluminum, mica, all other fixed types and variables. From 1990 on, Other includes mica, all other fixed types and variables. 1992 Other includes mica and all other fixed (variable data not available).
na- Not available.
SOURCE: EIA Marketing Services Department.

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U.S. SALES/SHIPMENTS

RESISTIVE PRODUCTS[1] **Table 6-8**

Sales (Millions of Units and Dollars); 1990-1991

	1990		1991	
	Units	Dollars	Units	Dollars
FIXED RESISTORS				
Carbon Composition and Carbon Film	366.1	36.0	315.5	31.3
Metal and Other Film	1,847.2	96.4	1,688.2	101.7
Chips	578.2	34.8	581.6	41.1
Wirewound	223.6	89.4	204.6	83.8
Total Fixed Resistors	3,015.1	256.6	2,789.9	257.9
VARIABLE RESISTORS				
Wirewound	19.3	68.3	12.2	59.2
Non-Wirewound	236.6	165.4	192.5	142.6
Total Variable Resistors	255.9	233.7	204.7	201.8
OTHER[2]	190.4	135.8	198.5	142.7
RESISTOR NETWORKS				
SIP	400.7	77.7	313.3	66.2
DIP	81.1	29.4	71.4	25.6
Surface Mount	118.5	36.8	149.5	46.8
Other	25.8	29.8	15.1	21.4
Total Resistor Networks	626.1	173.7	549.3	160.0
GRAND TOTAL	4,087.5	799.8	3,742.4	762.4

[1] Data represent shipments by manufacturers of resistors in the U.S. Products bought and resold without further manufacture are excluded. Past data reflects shipments of U.S.-manufactured products plus imports and was derived from an annual EIA survey of resistor manufacturers.
[2] Includes varistors, thermistors, and parts for resistors.
SOURCE: U.S. Department of Commerce, Bureau of the Census.

SURFACE MOUNT RESISTOR CHIPS

The move to surface mount resistor chips is the dominiant technology trend in the resistor industry. A strong link is developing between the expansion of the automotive industry's use of printed circuit boards (PCBs) and the increased use of surface mounted resistor chips. Product development trends in resistors are primarily toward thin- and thick-film resistor networks.

U.S. SALES/SHIPMENTS

SWITCHES

Table 6-8

U.S. Factory Shipments ($ Millions); 1982-1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]
Toggle	89.0	104.3	98.2	77.1	86.7	93.9	97.6	101.0	81.5	69.5
Slide	58.5	69.1	67.6	62.8	66.4	75.9	83.1	84.7	74.2	55.3
Rotary	72.5	64.8	83.1	73.8	66.5	77.0	68.4	55.8	63.9	57.9
Keyboard	22.0	33.1	48.9	36.5	39.6	45.9	38.7	32.2	34.7	31.5
Pushbutton	38.5	47.1	96.2	72.2	48.0	92.6	50.9	52.9	49.1	44.7
Snap-Action	30.7	14.1	13.1	21.4	10.0	11.8	13.5	7.1	18.6	20.7
Thumbwheel					45.0	42.0	29.1	20.8	17.1	14.0
Other Switches	134.9	179.4	140.6	232.8	174.6	252.9	243.3	289.9	240.3	232.1
TOTAL	446.1	511.9	547.7	576.6	536.8	692.0	624.6	644.4	579.4	525.7

[r] Revised.
SOURCE: U.S. Department of Commerce

ELECTRONIC RELAYS

Table 6-9

U.S. Factory Shipments ($ Millions); 1982-1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]
General Purpose										
over 100 MW					210.0	187.4	146.5	123.4	103.4	110.8
0-100 MW	42.8	49.7	241.9	244.5	10.0	8.7	9.2	23.0	20.6	17.3
Solid State					21.8	11.9	15.6	16.7	20.1	19.9
Sensitive Relays (through 100 MW)	10.7	na	na	na	na	na	na	na	na	na
Crystal can types	27.2	43.0	22.3	23.6	67.1	67.4	73.5	78.4	79.2	69.4
Reed Relays	[1]	54.5[2]	69.6	130.5	86.3	86.2	78.4	79.1	73.4	63.4
Miniature printed circuit mounted (sealed and unsealed)	na	19.0	27.9	36.4	18.8	22.3	26.3	21.3	19.8	16.8
Timing Relays	na	17.9	31.3	41.1	47.8	55.8	56.6	73.7	73.7	78.1
All other relays and parts	201.3	111.8	158.7	154.4	126.6	156.6	100.8	113.9	168.0	145.1
TOTAL	282.0	295.9	551.7	630.5	588.4	596.3	506.9	529.5	558.2	520.8

[r] Revised.
[1] Included in "all other relays and parts".
[2] Includes dry reed only.
SOURCE: U.S. Department of Commerce.

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U.S. SALES/SHIPMENTS

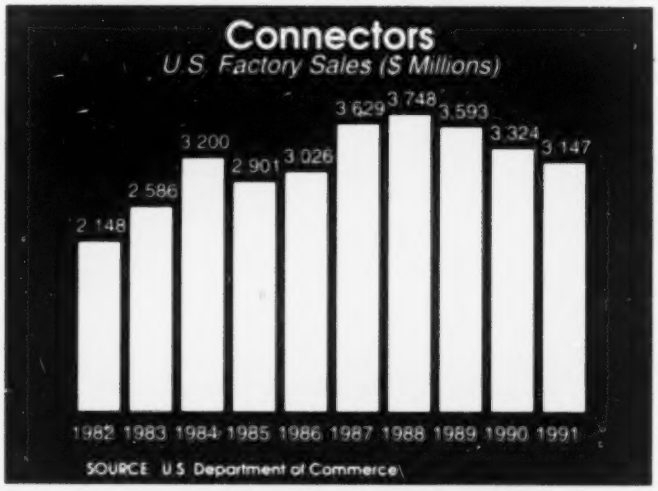
CONNECTORS

Table 6-10

U.S. Factory Shipments ($ Millions); 1982-1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]
Coaxial	214.4	211.2	256.5	331.9	347.4	470.4	454.3	405.1	420.0	371.5
Cylindrical	387.6	414.7	466.0	452.7	463.4	573.5	578.7	540.3	513.6	473.9
Rack and Panel	385.2	420.1	483.8	360.9	437.4	499.8	513.6	537.3	500.0	485.2
Printed Circuit	444.4	598.0	724.0	728.8	728.1	998.3	1149.8	986.4	804.9	770.4
Hermetic Sealed	90.0	152.5	177.1	168.8	152.1	174.5	126.9	129.3	165.1	145.9
Planar Cable[1]	208.8	263.2	310.0	217.8	212.6	229.5	247.3	244.5	284.1	267.7
Fiber Optic	na	na	na	na	5.8	8.1	6.8	17.6	17.6	73.1
Other	352.1	434.5	660.6	440.2	495.0	508.9	507.9	557.1	478.7	419.4
Parts for Connectors	65.7	91.8	122.4	199.7	183.9	166.2	162.5	175.3	139.5	139.9
TOTAL	2,148.2	2,586.0	3,200.4	2,900.8	3,025.7	3,629.2	3,747.8	3,592.9	3,323.6	3,146.9

[r] Revised
[1] Includes fiber optic connectors in 1984 & 1985.
SOURCE: U.S. Department of Commerce



CONNECTORS

Connectors were the strongest performing passive product in 1992. Connectors accounted for twice the level of any other single passive component, with 11 percent of the total market in 1992. PCB connectors account for the bulk (one-third) of the U.S. connector market, other connector types including cylindrical, rack and panel, planar hermetic sealed, and fiber optic connectors, each accounted for 5 to 10% of the remaining market. Connectors are expected to continue as a bright spot in the passive component market with strongest prospects in fiber-optic connectors, followed by printed circuit and special purpose connectors.

Connectors are expected to continue as a bright spot in the passive component market with strongest prospects in fiber-optic connectors, followed by printed circuit and special purpose connectors.

Although development of fiber optic connectors is still cost prohibitive, long term growth prospects appear good if future demand is strong. Shipments of fiber optic connectors are expected to reach $500 million by the year 2000 according to the U.S. Department of Commerce. The trend toward fiber optic connectors is driven by a number of benefits, including greater bandwidth and speed, lighter weight, and immunity to electromagnetic and radio frequency interference. However, the development of fiber-optic connectors must first become cost effective.

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U.S. SALES/SHIPMENTS

PIEZOELECTRIC DEVICES

Table 6-11

U.S. Factory Shipments ($ Millions); 1982-1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]
Oscillator Crystals	95.3	71.9	120.5	86.3	99.4	105.3	117.0	84.6	75.3	77.1
Crystal Oscillators	106.8	120.9	96.9	121.8	147.4	186.3	155.9	89.5	93.5	35.8
Crystal Filters	47.2	42.4	62.9	55.6	56.6	68.6	77.9	48.0	57.1	47.9
Crystal Blanks	16.9	21.7	59.9	74.5	15.9	34.6	30.2	25.7	34.1	36.2
TOTAL	266.2	256.9	340.2	338.2	319.3	394.8	381.0	247.8	260.1	256.9

[r] Revised.
SOURCE: U.S. Department of Commerce.

FILTERS

Table 6-12

U.S. Factory Shipments ($ Millions); 1982-1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]
Filters, except microwave:										
Mechanical	14.2	3.7	1.5	1.9	1.3	13.2	12.9	} 159.4	11.5	7.1
RFI/EMI Control	87.6	110.1	123.9	112.1	134.9	162.0	130.9		160.7	140.0
Feed-thru and Bypass Capacitors	9.0	21.6	24.1	7.0	8.1	na	na	na	na	na
Electronic Wave	31.5	31.1	82.7	57.1	65.7	57.3	46.0	23.8	25.1	26.3
TOTAL	142.3	166.5	232.2	178.1	210.0	232.5	189.8	183.2	197.3	173.4

[r] Revised.
na-Not Available.
SOURCE: U.S. Department of Commerce.

COILS AND TRANSFORMERS

Table 6-13

U.S. Factory Shipments ($ Millions); 1982-1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]
Audio Transformers	130.9	164.1	263.4	290.3	139.7	166.7	115.1	107.9	90.3	87.2
Low Frequency Chokes	26.2	27.0	30.0	29.9	34.3	33.9	55.0	51.4	39.9	37.1
Plate and Filament Transformers	187.1	196.0	192.5	186.1	174.1	188.4	191.4	175.9	137.6	128.3
Pulse Transformers, Computer and Other	98.5	88.2	113.5	124.4	143.1	160.4	174.5	156.3	153.0	146.5
RF Chokes	32.2	36.2	45.5	39.4	37.9	49.7	54.1	53.0	43.4	44.6
RF Coils	38.4	36.1	51.4	48.7	46.8	50.9	54.9	52.3	50.3	45.7
IF Transformers	19.9	15.6	19.0	20.9	16.2	14.2	14.7	14.6	14.8	21.1
TV Transformers & Reactors	35.1	46.8	35.0	38.9	38.2	35.6	32.4	29.0	22.6	20.9
Toroidal Windings	81.0	86.3	99.7	100.1	93.7	102.1	102.1	105.0	108.6	101.3
Other	192.7	269.2	205.1	300.3	317.7	347.0	389.0	354.4	315.1	314.7
TOTAL	842.0	965.5	1,055.1	1,179.0	1,041.7	1,148.9	1,183.2	1,099.8	975.6	947.6

[r] Revised.
SOURCE: U.S. Department of Commerce.

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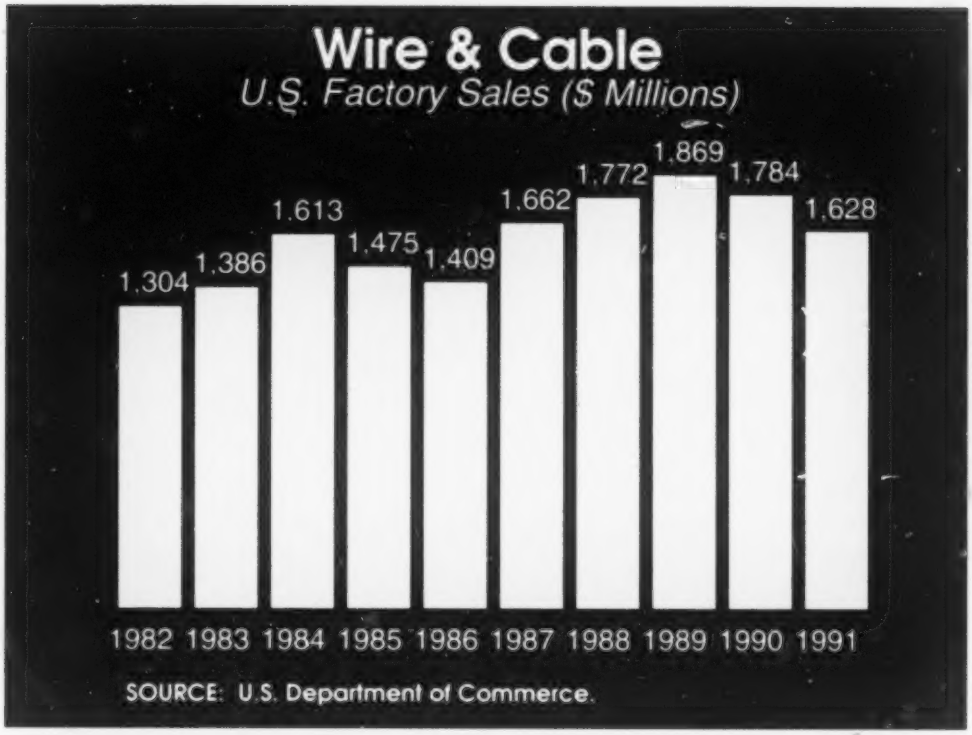
U.S. SALES/SHIPMENTS



ELECTRONIC WIRE AND CABLE **Table 6-14**

U.S. Factory Shipments ($ Millions); 1982-1991

	1982	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[r]
Coaxial Cable, armored or unarmored:										
Rigid and semiflexible	374.1	335.0	337.5	240.4	234.3	264.8	219.3	277.7	252.5	185.7
Flexible[1]	209.3	264.6	275.7	305.0	263.9	335.1	315.2	269.8	259.1	236.5
Antenna lead-in wire[2]	25.2	49.8	61.6	56.9	66.0	43.0	167.5	288.0	275.2	271.4
Hook-up wire, single conductor, shielded and nonshielded	222.6	245.7	291.7	274.4	275.3	354.4	332.4	331.7	326.6	279.7
Multiconductor, shielded and nonshielded:										
Flat and ribbon cable	54.8	80.3	93.4	73.9	78.2	86.0	102.4	96.9	97.6	93.7
Other	417.5	410.1	553.5	524.7	491.3	578.3	635.2	604.4	573.0	560.5
TOTAL	1,303.5	1,385.5	1,613.4	1,475.3	1,409.0	1,661.6	1,772.0	1,868.5	1,784.0	1,627.6

[1] Includes CATV/broadcast coaxial in 1985.
[2] Includes CATV/broadcast coaxial subsequent to 1985.
[r] Revised.
SOURCE: U.S. Department of Commerce.

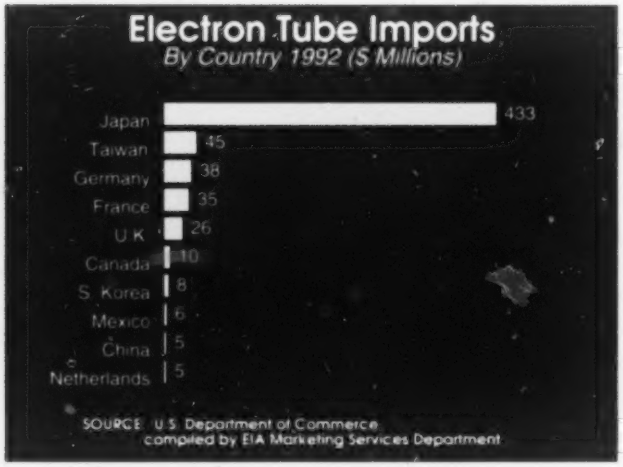
TRADE TRENDS

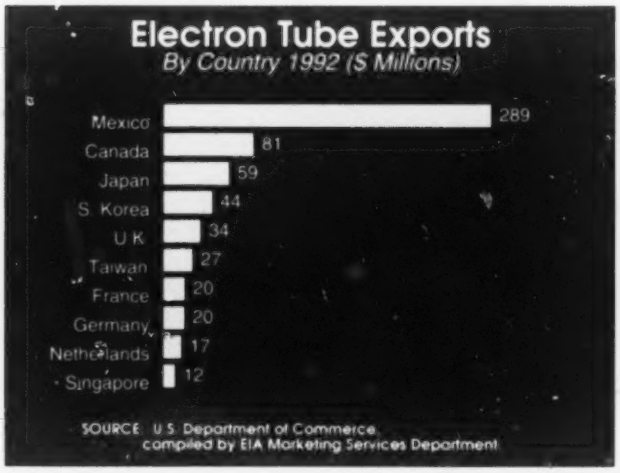
ELECTRON TUBES **Table 6-16**

U.S. Bilateral Trade (Thousands of Dollars), 1992

IMPORTS		% of Total	EXPORTS		% of Total
Japan	432,959	69.9%	Mexico	288,536	41.6%
Taiwan	44,665	7.2%	Canada	80,527	11.6%
Germany	37,745	6.1%	Japan	59,017	8.5%
France	34,557	5.6%	S. Korea	44,220	6.4%
U.K.	26,336	4.3%	U.K.	33,948	4.9%
Canada	10,066	1.6%	Taiwan	27,014	3.9%
S. Korea	8,390	1.4%	France	20,284	2.9%
Mexico	5,867	0.9%	Germany	19,973	2.9%
China	5,116	0.8%	Netherlands	17,286	2.5%
Netherlands	4,869	0.8%	Singapore	11,724	1.7%
Other	8,417	1.4%	Other	90,944	13.1%
TOTAL	618,987	100.0%	TOTAL	693,473	100.0%

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.





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TRADE TRENDS

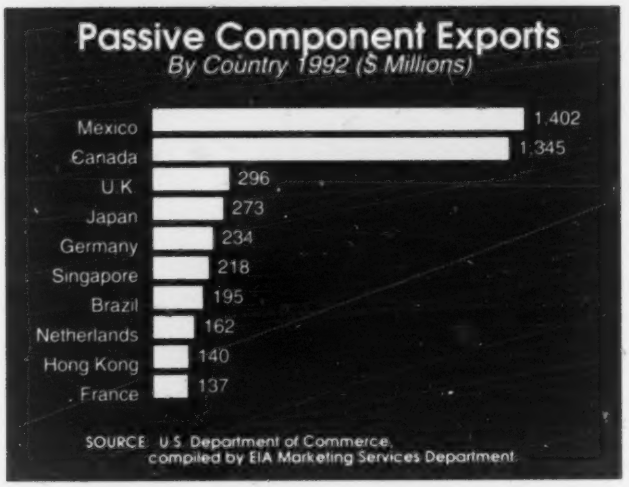
PASSIVE COMPONENTS

Table 6-17

U.S. Bilateral Trade (Thousands of Dollars), 1992

IMPORTS		% of Total	EXPORTS		% of Total
Japan	2,197,762	24.9%	Mexico	1,402,287	24.5%
Mexico	2,052,718	23.2%	Canada	1,344,989	23.5%
Taiwan	1,092,233	12.4%	U.K.	295,985	5.2%
Canada	788,223	8.9%	Japan	272,823	4.8%
Singapore	447,517	5.1%	Germany	233,775	4.1%
Hong Kong	299,937	3.4%	Singapore	217,655	3.8%
Germany	292,520	3.3%	Brazil	195,215	3.4%
China	279,019	3.2%	Netherlands	161,706	2.8%
Malaysia	224,288	2.5%	Hong Kong	139,856	2.4%
S. Korea	200,872	2.3%	France	137,219	2.4%
Other	964,460	10.9%	Other	1,329,586	23.2%
TOTAL	8,839,549	100.0%	TOTAL	5,731,096	100.0%

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.



TRADE TRENDS

U.S. exports of solid state products jumped 12% in 1992, the 7th consecutive annual increase...

SOLID STATE PRODUCTS

Table 6-18

U.S. Imports & Exports (Millions of Dollars), 1983-1992

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Imports	4,981	7,645	5,704	5,952	7,605	10,790	12,304	12,182	13,121	15,489
Exports	4,361	5,332	4,237	4,866	6,226	9,747	11,946	13,481	14,502	16,180
Balance of Trade	(620)	(2,313)	(1,467)	(1,086)	(1,379)	(1,043)	(358)	1,299	1,381	689

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.

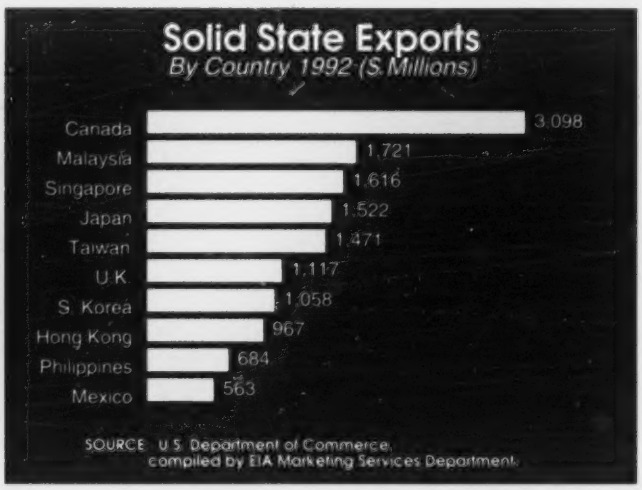
SOLID STATE COMPONENTS

Table 6-19

U.S. Bilateral Trade (Thousands of Dollars), 1992

IMPORTS		% of Total	EXPORTS		% of Total
Japan	4,403,504	28.4%	Canada	3,098,007	19.1%
Malaysia	2,020,462	13.0%	Malaysia	1,720,596	10.6%
S. Korea	1,982,968	12.8%	Singapore	1,616,249	10.0%
Canada	1,728,487	11.2%	Japan	1,521,784	9.4%
Singapore	1,253,503	8.1%	Taiwan	1,470,705	9.1%
Taiwan	931,111	6.0%	U.K.	1,116,651	6.9%
Philippines	826,399	5.3%	S. Korea	1,057,659	6.5%
Hong Kong	371,970	2.4%	Hong Kong	966,728	6.0%
Mexico	362,584	2.3%	Philippines	683,965	4.2%
Germany	322,677	2.1%	Mexico	562,698	3.5%
Other	1,285,600	8.3%	Other	2,364,476	14.6%
TOTAL	15,489,265	100.0%	TOTAL	16,179,518	100.0%

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Department.



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ELECTRON TUBES

Electron tube exports reached $693 million in 1992, up 6% from the prior year. Tube exports were slowed by recessions overseas and by a trend in color TV production towards larger screen sizes. Large completed tubes are fragile and expensive to ship, making domestic production in overseas countries a more attractive option. U.S. imports of electron tubes increased 13% to $618 million in 1992. Bilateral trade in electron tubes was dominated by two countries, Japan on the import side and Mexico on the export end. Japan accounted for nearly 70% of all electron tube imports in 1992, while 42% of tube exports were sent to Mexico.

TRADE TRENDS

ELECTRON TUBES — **Table 6-20**

U.S. Balance of Trade ($ Millions); 1983 - 1992

Year	Imports	Exports	Balance of Trade
1983	159.9	219.8	+ 59.9
1984	194.7	241.2	+ 46.5
1985	218.5	250.9	+ 32.4
1986	255.2	282.3	+ 27.1
1987	268.9	266.2	- 2.7
1988	347.1	430.8	+ 83.7
1989	552.1	438.5	- 113.6
1990	515.1	517.5	+ 2.4
1991	545.7	655.6	+109.9
1992	618.9	693.5	+74.6

SOURCE: U.S. Department of Commerce

ELECTRON TUBES — **Table 6-21**

U.S. Imports ($ Millions); 1988-1992

	1988	1989	1990	1991	1992
TV Picture Tubes, Color	54.7	73.7	72.8	69.5	66.9
TV Picture Tubes, B/W	2.3	1.8	7.6	4.8	7.7
TV Picture Tubes, Projection	22.5	48.3	60.0	65.4	66.9
Cathode Ray Tubes, N.E.S.	122.2	274.0	239.9	264.0	303.3
Receiving Tubes	5.3	4.3	3.1	2.7	3.4
Gas and Vapor Tubes	5.8	1.5	1.3	1.2	1.3
Diode, Triode and Tetrode Tubes	6.5	8.0	9.9	11.2	9.6
Magnetrons[1]	50.5	60.7	36.8	39.4	53.9
Klystrons	10.1	9.3	10.1	14.8	13.1
Other Microwave Tubes	9.8	22.7	26.7	24.6	44.3
Light Sensing Tubes	15.3	32.6	34.6	38.4	4.03
Other Light Tubes (Light Emitting)	42.1	15.2	12.3	9.7	8.2
TOTAL	347.1	552.1	515.1	545.7	618.9

[1] Includes magnetrons for microwaves.
SOURCE: U.S. Department of Commerce.

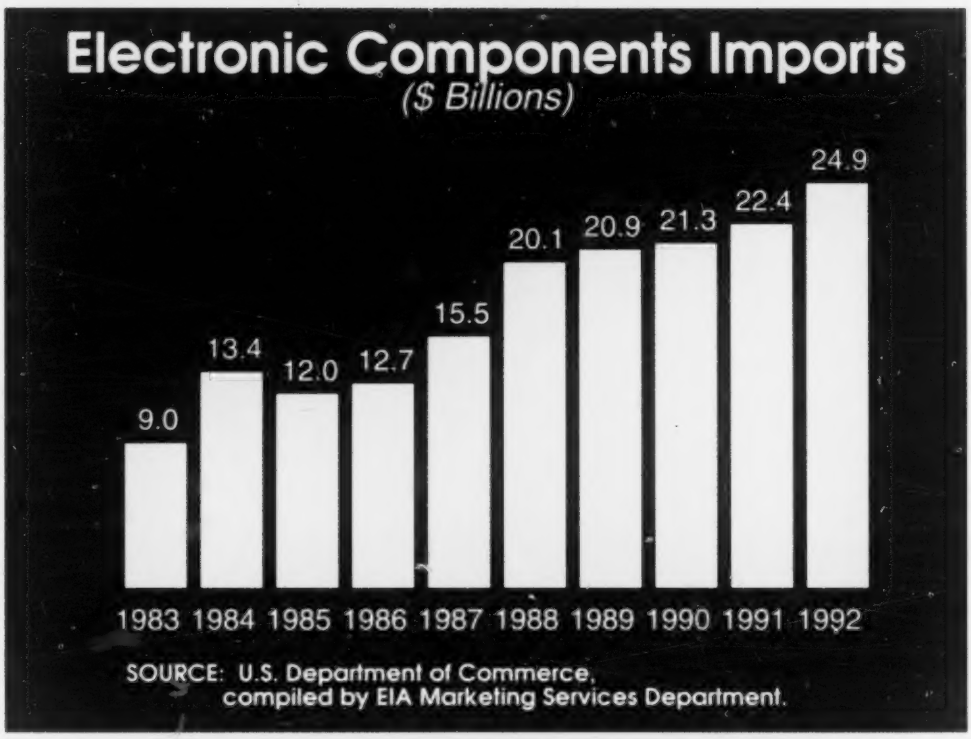
ELECTRON TUBES — **Table 6-22**

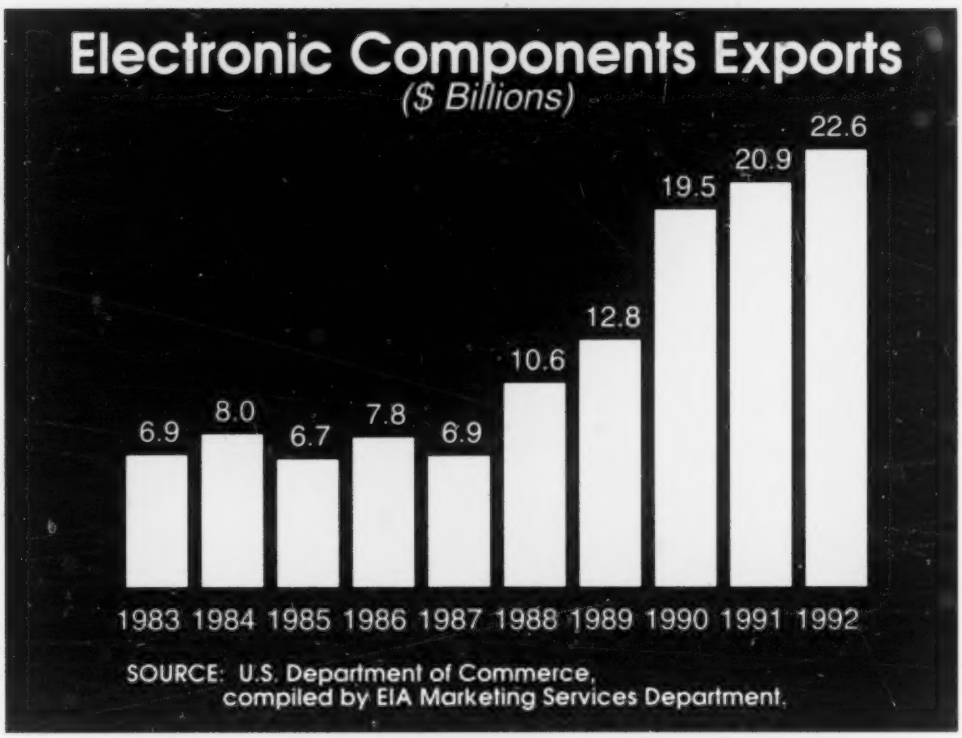
U.S. Exports ($ Millions); 1988-1992

	1988	1989	1990	1991	1992
Receiving Tubes	11.9	4.1	5.4	5.5	6.4
TV Picture Tubes, B/W	4.2	2.2	4.3	6.2	5.4
TV Picture Tubes, Color	129.4	165.2	244.1	336.4	379.9
Cathode Ray Storage Tubes	7.3	19.2	26.9	13.2	10.7
Cathode Ray Tubes, N.E.S.[1]	79.2	103.2	86.2	143.6	161.4
Gas and Vapor Tubes	10.7	9.0	6.7	8.3	6.1
Diode, Triode, and Tetrode Tubes	40.6	37.4	38.9	40.6	34.3
Photomultiplier Tubes	36.9	18.2	16.6	15.8	13.7
Klystrons	9.6	14.7	14.0	13.2	14.8
Magnetrons	10.9	11.6	12.4	12.8	11.6
Traveling Wave Tubes & BWOS	67.6	53.7	62.0	60.0	49.2
Electron Tubes, N.E.S.	22.5	na	na	na	na
TOTAL	430.8	438.5	517.5	655.6	693.5

[1] Includes TV Camera Tubes
na-Not available
SOURCE: U.S. Department of Commerce

TRADE TRENDS





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TRADE TRENDS

COLOR TV PICTURE TUBES

Table 6-23

U.S. Imports, by Country of Origin (Number of Units and Dollars); 1988-1992

	1988		1989		1990		1991		1992	
	Units	Dollars	Units	Dollars	Units	Dollars	Units	Dollars	Units	Dollars
Canada	80,119	9,119,409	70,681	9,059,909	2,394	398,520	48,321	5,710,540	31,445	3,860,844
China[1]	-	-	-	-	-	-	19,485	1,490,603	27,734	2,182,757
Germany[1]	-	-	-	-	-	-	47,498	10,645,351	7,086	1,647,235
Japan	94,791	43,200,987	122,301	56,385,184	146,620	53,855,611	109,459	46,263,304	108,881	47,806,430
Korea	14,977	934,679	21,885	1,271,305	34,472	3,144,521	6,075	384,784	7,579	548,410
Malaysia[2]	-	-	-	-	-	-	-	-	58,736	2,511,143
Taiwan	14,383	668,389	15,743	992,477	56,767	2,775,644	100,987	4,580,787	147,965	7,376,548
Other	3,827	761,593	66,452	6,036,491	119,150	12,552,123	1,566	450,347	6,204	915,019
TOTAL	208,097	54,685,057	297,062	73,745,366	361,682	72,835,080	333,391	69,525,716	395,630	66,858,386

[1] Prior to 1991, China and Germany included in "other".
[2] Prior to 1992, Malaysia was included in "other".
SOURCE: U.S. Department of Commerce.

MONOCHROME PICTURE TUBES

Table 6-24

U.S. Imports (Number of Units and Dollars); 1988-1992

	1988	1989	1990	1991	1992
Units	48,500	27,236	70,135	115,630	229,730
Dollars	2,329,319	1,816,128	7,632,118	4,766,806	7,711,889

SOURCE: U.S. Department of Commerce.

TRADE TRENDS

SOLID STATE PRODUCTS

Table 6-25

U.S. Imports ($ Millions); 1991-1992

	1991	1992
IMPORTS		
INTEGRATED CIRCUITS		
Monolithic, Linear	1,240.8	1,286.1
Monolithic, Bipolar	936.2	855.4
Monotholic, Metal Oxide Silicon (MOS)	7,805.9	9,715.3
Monolithic, Other	185.5	59.3
Other	426.1	486.1
TRANSISTORS		
Signal Transistors (Dissipation rates of less than one watt)	159.6	189.8
Power Transistors (Dissipation rates of one watt or more)	317.2	362.8
DIODES AND RECTIFIERS		
Solar Cells and Other Photosensitive	123.7	180.2
Zener	48.1	64.5
Microwave	28.5	41.0
Thyristors	71.5	72.4
LEDs	89.9	131.0
Other	225.6	236.4
OTHER		
Chips, Dice and Wafers	1,058.3	1,341.2
Parts of Semiconductors	401.7	467.8
TOTAL	13,118.6	15,489.3

U.S. Exports ($ Millions); 1991-1992

	1991	1992
EXPORTS		
INTEGRATED CIRCUITS		
Monolithic, Linear	616.7	717.0
Monolithic, Bipolar	587.9	792.3
Monolithic, Metal Oxide Silicon (MOS)	5,170.8	5886.3
Monolithic, Other	82.9	159.3
Other	471.1	575.9
TRANSISTORS		
Signal Transistors (Dissipation rates of less than one watt	68.6	64.6
Power Transistors (Dissipation rates of one watt or more	143.8	147.9
DIODES AND RECTIFIERS		
Solar Cells and Other Photosensitive	92.4	114.9
Zener	20.3	25.8
Microwave	32.9	30.8
Thyristors	25.0	25.6
LEDs	36.0	63.2
Other	96.2	91.4
OTHER		
Chips, Dice and Wafers	6,340.5	6,818.4
Parts for Diodes, Rectifiers, Transistors, ICS, and Semiconductors	615.8	577.2
Other Related Electronic Components	102.7	78.9
TOTAL	14,503.8	16,179.5

na-Not Available.
SOURCE: U.S. Department of Commerce.

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TRADE TRENDS

PASSIVE AND OTHER COMPONENTS ($ Millions); **Table 6-26**
U.S. Balance Of Trade, 1990-1991

	IMPORTS		EXPORTS		BALANCE OF TRADE	
	1991r	1992	1991r	1992	1991r	1992
Transformers, Rectifiers Rectifying Apparatus and Parts	1,283.9	1,460.9	238.4	248.6	-1,045.5	-1,212.2
Loudspeakers, Microphones and Amplifying Equipment	266.8	295.3	134.9	124.7	-131.9	-170.6
TV Tuners, Reception Equipment, and Parts of Phono and Tape Players	2,031.2	1,604.3	2,022.8	983.7	-8.4	-620.6
Capacitors	545.4	628.3	635.3	716.4	+89.9	+88.1
Switches and Relays	525.4	617.4	341.7	364.7	-183.7	-252.7
Connectors	473.8	533.2	138.2	401.0	-335.6	-132.2
Printed Circuit Boards	1,903.9	1,242.6	1,577.6	1,146.1	-326.3	-96.5
Resistors	336.2	391.1	242.8	262.3	-93.4	-128.8
Wire & Cable	1,101.7	986.0	1,499.1	1,060.6	+397.4	+74.6
Indicator Panels	489.5	597.2	225.0	250.7	-264.5	-346.5
Other	422.6	483.2	191.5	172.3	-231.1	-310.9
TOTAL	9,380.4	8,839.4	7,247.3	5,731.1	-2,133.1	-3,108.3

SOURCE: U.S. Department of Commerce

PASSIVE COMPONENTS

U.S. passive component manufacturers tallied $5.7 billion in export sales in 1992, while imports rose to $8.8 billion. Mexico and Canada are the primary markets for U.S. made passive components, accounting for 48% of purchases. Japan and Mexico are the primary import sources for passives, also with 48% of total imports.

ELECTRONIC COMPONENTS HISTORICAL MACROECONOMIC DATA

U.S. ($ Millions), 1990-1992

Table 6-27

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
FACTORY SALES													
1990	4,612	4,983	5,184	4,885	5,022	5,184	4,597	5,034	5,153	4,943	5,008	4,679	59,283
1991	4,472	5,061	5,163	5,000	5,176	5,288	4,769	5,092	5,307	5,134	5,260	4,979	60,701
1992	4,794	5,217	5,366	5,154	5,131	5,452	4,963	5,208	5,777	5,701	5,635	5,746	64,144
NEW ORDERS													
1990	4,722	5,077	5,377	5,109	5,302	4,642	4,299	5,064	4,606	4,823	4,865	4,554	58,440
1991	4,326	5,990	5,145	5,977	5,101	4,291	4,663	4,803	5,037	4,847	5,627	5,169	60,976
1992	5,134	5,602	4,826	5,538	5,232	5,397	5,013	5,224	5,823	5,687	5,880	5,902	65,258
INVENTORY													
1990	9,387	9,398	9,490	9,510	9,598	9,534	9,717	9,548	9,444	9,416	9,415	9,262	9,477
1991	9,362	9,192	9,220	9,363	9,365	9,300	9,418	9,358	9,172	9,118	8,918	8,647	9,203
1992	8,589	8,699	8,696	8,666	8,612	8,680	8,755	8,849	8,801	8,686	8,616	8,619	8,689

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
IMPORTS													
1990	1,629	1,556	1,867	1,798	1,828	1,797	1,897	1,851	1,707	1,814	1,833	1,691	21,268
1991	1,744	1,750	1,910	1,951	1,792	1,756	1,884	1,844	1,910	2,151	1,887	1,859	22,438
1992	1,816	1,877	2,206	2,015	1,954	2,141	2,045	2,069	2,263	2,326	2,079	2,154	24,946
EXPORTS													
1990	1,461	1,459	1,717	1,554	1,722	1,825	1,527	1,718	1,673	1,726	1,612	1,527	19,521
1991	1,659	1,612	1,868	1,757	1,790	1,813	1,653	1,741	1,757	1,940	1,792	1,531	20,913
1992	1,726	1,806	1,906	1,779	1,804	1,846	1,819	1,794	2,084	2,151	1,965	1,923	22,602

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Avg.
FINISHED EQUIPMENT FACTORY PRICE INDEX (12/90=100)													
1990	100.3	100.3	100.3	100.2	100.3	100.5	99.7	99.4	99.6	100.0	100.2	100.0	100.1
1991	100.8	100.9	100.8	100.8	100.3	100.7	100.4	100.3	99.9	99.7	99.5	99.7	100.3
1992	98.9	99.5	100.0	99.9	99.7	99.4	99.4	99.1	99.0	99.1	98.6	98.8	99.3

SOURCE: U.S. Department of Labor; compiled by EIA Marketing Services Department

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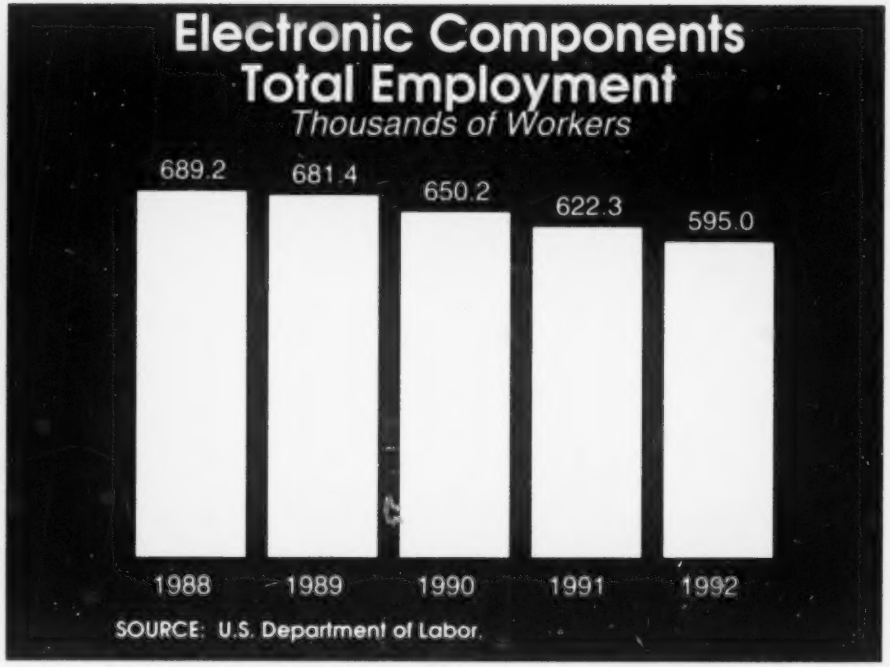

ELECTRONIC COMPONENTS EMPLOYMENT **Table 6-28**

U.S. (Thousands of Workers), 1988-1992

	1988	1989	1990	1991	1992
All Employees	689.2	681.4	650.2	622.3	595.0
Production Workers	387.8	384.7	369.9	356.5	345.5
Women Employees	313.0	309.5	295.3	282.6	270.2
Wage Index (12/88=100)	101.1	105.0	108.9	113.2	117.5

SOURCE: U.S. Department of Labor, compiled by EIA Marketing Services Department.

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ECONOMIC OVERVIEW

ELECTRON TUBES (SIC Code 3671) Table 6-29
U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
California	10,742	37.1
Massachusetts	3,719	12.8
Ohio	2,476	8.6
New York	2,193	7.6
Pennsylvania	684	2.4
TOTAL	28,949	100.0

Note: Additional detail on employment is available from the EIA Research Center. Please see front inside cover for details.
SOURCE: *Employment and Wages Annual Averages, 1991*, U.S. Department of Labor, Bureau of Labor Statistics.

PRINTED CIRCUIT BOARDS (SIC Code 3672) Table 6-30
U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
California	25,984	26.9
Illinois	6,994	7.2
New York	5,885	6.1
Minnesota	5,618	5.8
Florida	4,987	5.2
TOTAL	96,660	100.0

SOURCE: *Employment and Wages Annual Averages, 1991*, U.S. Department of Labor, Bureau of Labor Statistics.

SEMICONDUCTORS AND RELATED DEVICES (SIC Code 3674) Table 6-31
U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
California	60,098	26.0
Texas	38,285	16.5
New York	15,865	6.9
Massachusetts	13,421	5.8
Florida	13,135	5.7
TOTAL	231,497	100.0

SOURCE: *Employment and Wages Annual Averages, 1991*, U.S. Department of Labor, Bureau of Labor Statistics.

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ELECTRONIC CAPACITORS (SIC Code 3675) **Table 6-32**
U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
South Carolina	5,053	25.1
California	2,338	11.6
North Carolina	1,688	8.4
Massachusetts	1,473	7.3
Florida	1,248	6.2
TOTAL	20,163	100.0

SOURCE: *Employment and Wages Annual Averages, 1991*, U.S. Department of Labor, Bureau of Labor Statistics.

ELECTRONIC RESISTORS (SIC Code 3676) **Table 6-33**
U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
Indiana	1,760	15.7
Texas	1,222	10.9
Pennsylvania	711	6.3
California	698	6.2
New Jersey	667	5.9
TOTAL	11,215	100.0

SOURCE: *Employment and Wages Annual Averages, 1991*, U.S. Department of Labor, Bureau of Labor Statistics.

ELECTRONIC COILS AND TRANSFORMERS (SIC Code 3677) **Table 6-34**
U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
Indiana	2,567	14.7
Illinois	2,390	13.7
New York	2,137	12.2
California	1,661	9.5
Florida	945	5.4
TOTAL	17,459	100.0

SOURCE: *Employment and Wages Annual Averages, 1991*, U.S. Department of Labor, Bureau of Labor Statistics.

ECONOMIC OVERVIEW

ELECTRONIC CONNECTORS (SIC Code 3678)

Table 6-35

U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
Pennsylvania	3,397	22.0
California	2,404	15.6
New York	1,247	8.1
Connecticut	1,144	7.4
Missouri	1,117	7.2
TOTAL	15,439	100.0

SOURCE: *Employment and Wages Annual Averages, 1991*, U.S. Department of Labor, Bureau of Labor Statistics.

ELECTRONIC COMPONENTS, NEC (SIC Code 3679)

Table 6-36

U.S. AVERAGE ANNUAL EMPLOYMENT 1991; TOP U.S. STATES & TOTAL

	Employment	% of Total
California	32,998	24.4
Texas	12,797	9.5
New York	10,874	8.0
Illinois	7,855	5.8
Pennsylvania	6,822	5.0
TOTAL	135,216	100.0

NEC - Not elsewhere classified.
SOURCE: *Employment and Wages Annual Averages, 1991*, U.S. Department of Labor, Bureau of Labor Statistics.

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7: GOVERNMENT ELECTRONICS

EIA GOVERNMENT DIVISION

The Government Division of EIA consists of member companies who either manufacture or engage in research and development of products, specifically designed or manufactured to meet government specifications or require special features not readily available in standard commercial equipment. Membership also includes companies who provide operations, maintenance and support services to the government agencies.

The Division's symposiums, studies, and forecasts covering the federal government markets have become the authoritative sources for industry, government, academia and press on this specialized and important electronics sector. For more information or to order any of the highlighted publications, contact Kelly Curtis at (202) 457-8748.

EIA TEN-YEAR FORECAST OF DEFENSE ELECTRONICS (FYs 1993-2002)*

EIA forecasts that the Department of Defense (DoD) budget, measured in constant FY 1993 dollars, will decline from $281 billion in 1992 to $197 billion in FY 2002 (Figure 6-A). Defense procurement budgets are expected to stabilize beginning in the mid-1990s, and slightly increase near the turn of the century.

As the military shrinks after the Cold War, DoD will still need to continue buying equipment to replace obsolete and old systems. The EIA study indicates DoD will reach that minimum sustaining level of investment with the 1997 budget. Defense spending below that level is unlikely since it would mean abandoning a strong military -- a situation which the U.S. is not ready to accept.

Despite the forecast of a flat budget for defense procurements, there will be increasing purchases of electronic equipment.

EIA forecasts continued steady DoD science and technology funding as the Pentagon strives to maintain its technological lead. Programs currently in development will begin production, with few new starts coming in. The net result will be a reduction of almost $15 billion in RDT&E (Research, Development, Testing and Evaluation) budgets over the next ten years (Figure 6-B).

EIA forecasts total DoD electronic systems spending of $409 billion over the ten-year forecast period. While still large, DoD will place a greater emphasis on commercial products and affordable systems.

Despite the forecast of a flat budget for defense procurement, there will be increasing purchases of electronic equipment, with contractors the winners. Production will be limited to the most advanced weapon systems and high technology will be inserted into existing equipment through modifications and upgrades. In addition, a majority of the research and development investment will be in electronics. Suppliers of state-of-the-art electronic systems can therefore expect modest growth in their defense market.

* The EIA Ten-Year Forecast is based on statistical analyses and supported by extensive interviews with defense and aerospace experts from DoD, NASA, Congress, the administration, "think tanks" and Wall Street. Budget forecasts are balanced against a bottom-up estimate of program costs and checked against a sophisticated numerical model of the U.S. defense budget. The resulting forecast is highly regarded by defense experts in government and industry.

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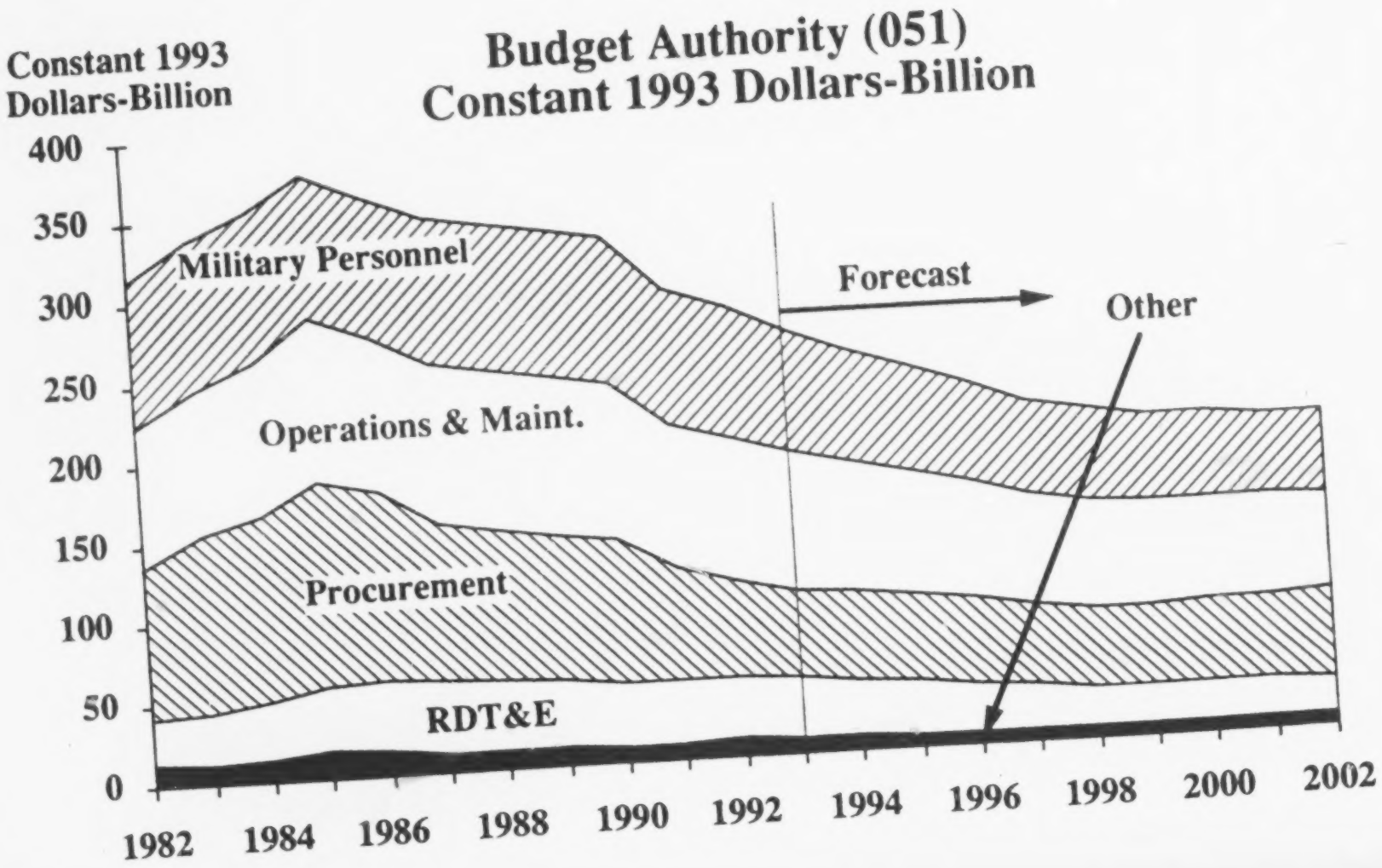
DoD Budget Forecast

Figure 6-A



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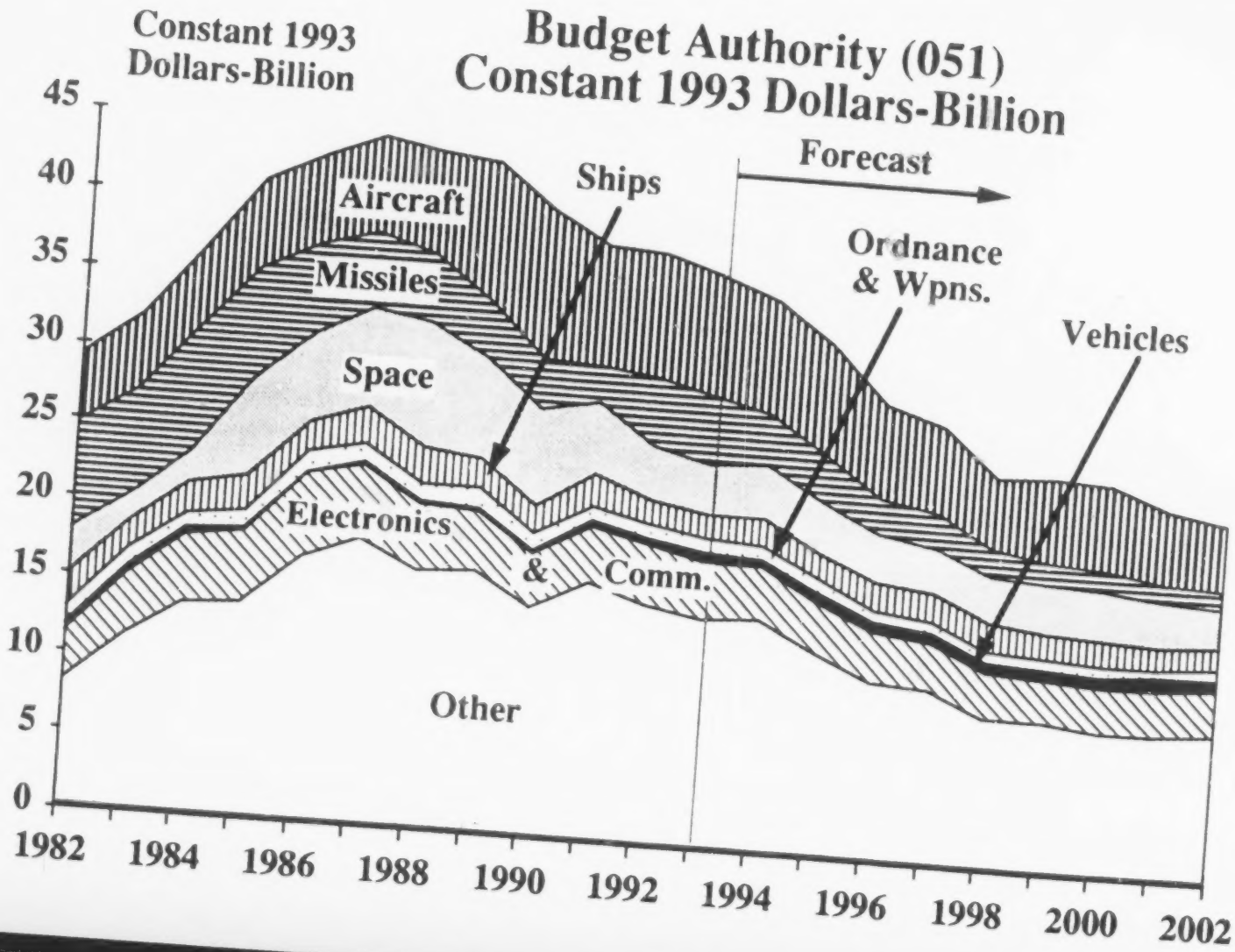
DoD RDT&E Budget Forecast

Figure 6-B



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NASA

The NASA budget will be reduced in real terms by about 8 percent over the next four years (Figure 6-C) due to federal budget pressures. However, NASA management is adjusting to these constraints and plans to pursue new programs that are affordable and relatively quick to accomplish. Assuming these efforts are successful, NASA should see its esteem--and its budgets--begin to rise again.

EIA anticipates growth in NASA purchases of high technology electronic systems. Smaller, more affordable exploration spacecraft will contain more electronics than past programs, making NASA a promising, though smaller, market for electronics companies.

MISSIONS, PROGRAMS AND TECHNOLOGY REVIEW

Affordability is the watchword in EIA's ratings on the viability and chances for survival of over 500 programs in this resource constrained, limited threat environment. Programs that are already in existence and are meeting time and cost parameters will have the best staying power and are the most likely candidates for technology insertion, according to EIA.

The debate on "roles" and "missions" has started as DoD continues to scale back and rethink its strategy and force structure needs. Already DoD has excess equipment and capacity, which means some "bread and butter" programs will fade.

According to the study, there is a long way to go before commercialization will have a significant impact on the bottom line. Analysis of the science and technology area reinforces the themes of technology insertion, early entry into programs via ATD's (Advanced Technology Demonstration) and the criticality of affordable process as well as product.

"Business as usual" is over and companies must adapt or lose out. The bottom line message is that industry will find opportunities in RDT&E and procurement, especially in electronics, but must provide affordable solutions.

DoD SCIENCE & TECHNOLOGY STRATEGY: IMPACT ON DEFENSE ELECTRONICS

The DoD Director of Defense Research and Engineering (DDR&E) has put forward a new Science and Technology (S&T) strategy, but the ultimate success of this new approach to technology development is uncertain, according to EIA.

The new strategy is aimed at focusing on capabilities or "thrusts" based on worst-case Desert Storm warfighting needs--extended to the early part of the next century. The S&T efforts come together at the 6.3A budget program (combination of Defense Programs funded under the Budget Line for Advanced Development Programs—6.3A) level with the emphasis on high payoff (high leverage) Advanced Technology Demonstrations (ATDs) (Figure 6-D). The five warfighting thrusts are:

- Global Surveillance and Communications (Thrust 1)
- Precision Strike (Thrust 2)
- Air Superiority and Defense (Thrust 3)
- Sea Control and Undersea Superiority (Thrust 4)
- Advanced Land Combat (Thrust 5).

New to the strategy is the involvement of the user through simulation (Thrust 6, Synthetic Environments) and the assurance of producibility and affordability at every step (Thrust 7, Technology for Affordability).

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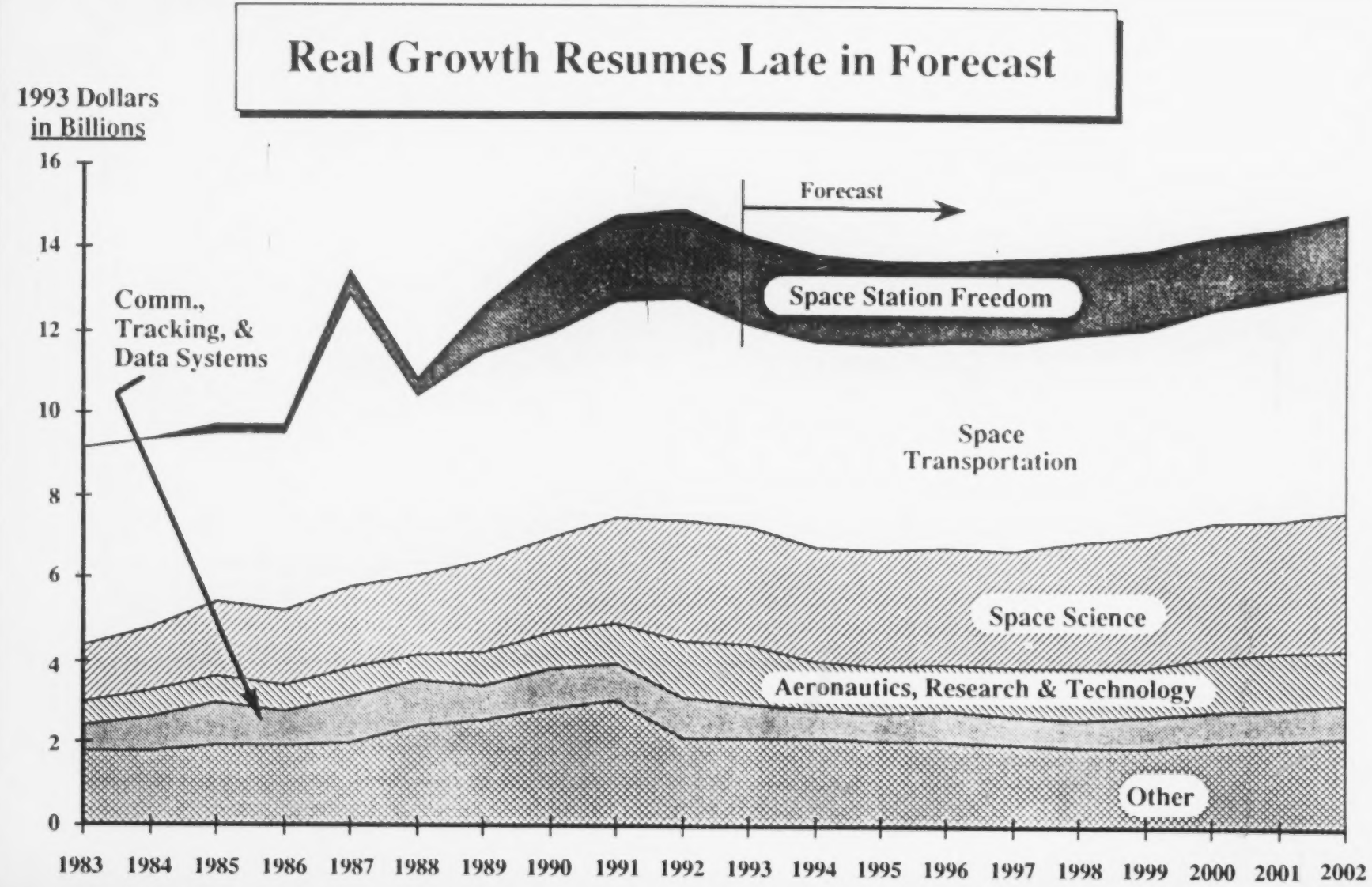
NASA Forecast

Figure 6-C



84% of 6.3A Funds Support S&T Thrusts

($2.1B out of $2.5B Total: FY93 Request)

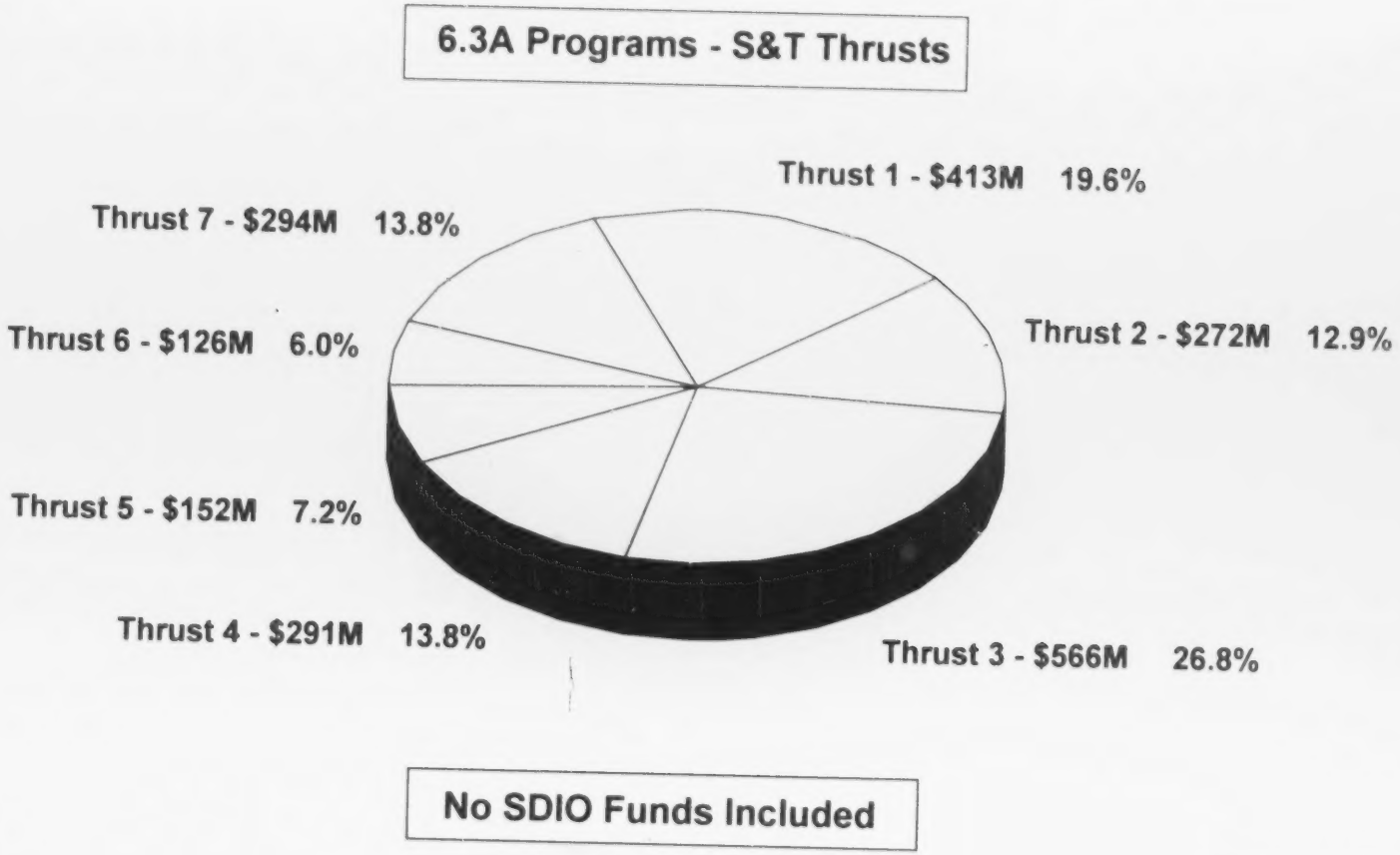

6.3A Programs - S&T Thrusts
Thrust 1 - $413M 19.6%
Thrust 2 - $272M 12.9%
Thrust 3 - $566M 26.8%
Thrust 4 - $291M 13.8%
Thrust 5 - $152M 7.2%
Thrust 6 - $126M 6.0%
Thrust 7 - $294M 13.8%
No SDIO Funds Included

Figure 6-D

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Simulation and modeling is a certain growth area and the message is to get on the Defense Simulation Internet and participate in the evolving world of synthetic environments.

With a diminishing budget and no clear military technological challenges on the horizon, Science and Technology can focus on incremental improvements. For example, simulation can be used on weapon systems to test the military viability of upgrades and producibility measures can be used to assure affordability, without actually moving systems to full production.

The emphasis is on technology insertion and the key to success is integration across systems, services and thrusts.

Simulation and modeling is a certain growth area and the message to industry is to get on the Defense Simulation Internet and participate in the evolving world of synthetic environments.

The emphasis is on technology insertion and the key to success is integration across systems, services and thrusts.

EIA examined the characteristics of the entire S&T effort including 6.1 budget line for research programs (primarily in Universities), 6.2 budget line for exploratory development programs and 6.3A budget line for advanced development programs. The billion dollar a year research account has a strong laboratory constituency. There has been some discussion of making the research efforts single-service at the OSD (Office of the Secretary of Defense) level, perhaps using as a model the Office of Naval Research. The 6.2 programs have long supported the service labs with about $3 billion a year.

Now there are discussions of consolidating to single centers of excellence serving all services. One possibility is to give DARPA (now ARPA; Defense Advanced Research Projects Agency) responsibility for all 6.2 efforts and to operate the labs as Government-Owned, Contractor-Operated (GOCO) facilities in a manner similar to the operation of Department of Energy (DOE) National Labs. Project Reliance, a tri-service effort aimed at lab consolidation, may be rejuvenated as the services try to protect R&D interest from expanding DDR&E direction and control. Finally, 6.3A advanced development is the program level at which industry principally participates with roughly 85% of program funds contracted to industry. Overall, about 50% of the S&T $6 to $7 billion annual budget exclusive of SDIO (Strategic Defense Initiatives Organization,"Star Wars") is contracted to industry.

There are several other consequences of the new S&T strategy. Budgets for 6.3A programs are likely to increase as DDR&E attempts to use ATDs in an ever-expanding way. As a consequence, 6.3B demonstration/validation will be reduced in scope and duration by risk reduction efforts in 6.3A. Funding for 6.2 exploratory development programs may well be squeezed as dollars are transferred to the expanding 6.3A account. More of the 6.2 programs will be shaped by the thrusts and DDR&E has organized 11 key technologies (replacing last year's set of 21 critical technologies) related to technology needs of each thrust. The emphasis on technologies supporting top-down needs means that technology-push or technology breakthrough research efforts will be curtailed.

SPECIAL OPERATIONS MARKET

The EIA Special Operations market study addresses the U.S. Special Operations Command (USSOCOM) budget and market in considerable detail. The market is easily identifiable and readily quantifiable, but small and focused on SOF (Special Operations Forces)-unique requirements. In fact, the "addressable" market (RDT&E, Procurement and Contract Services) amounts to about $1.2 billion per year of which only about $300 to $400 million per year is awarded in new contracts.

C3

The EIA Command, Control and Communications (C3) budget forecasts that the C3 budgets will decline, but less than the overall defense budget. The C3 business is highly valued for its potential to be a force multiplier (refers to increase of fighting capability through additional sophisticated weaponry rather than adding more personnel into the equation).

There is a decline forecast in RDT&E, both because of the availability of COTS (Commercial-Off-the-Shelf) products and because the commercial industry in general is leading in the communication field.

STRATEGIC DEFENSE INITIATIVE/THEATER MISSILE DEFENSE

The Strategic Defense Initiative (SDI)/Theater Missile Defense (TMD) study projected out through 2005 (Figure 6-E) shows the budget dedicated to research the early years. The Phase I programs are identified in 1987, and funding begins for Theater Missile Defense. This disconnect occurs in 1991 because Congress segregated funding under a Theater Missile Defense Initiative line. While meant to be a separate, distinct initiative, the DoD placed this initiative under the control of the SDIO director. The projection for the next dozen years is that of SDIO.

Through 2000 there is very little change in funding for the research and space-based interceptor segment (Figure 6-F). TMD funding starts increasing in FY 1995 in preparation for initial deployment, while NMD (National Missile Defense) increases somewhat later. While SDIO funding is predicted to remain relatively flat, the transfer of production to the services for theater missile defense results in an overall increase in funding.

FIVE-YEAR FORECAST OF FEDERAL INFORMATION SYSTEMS NEEDS

The federal information systems market will grow only about 0.2% annually in real terms for FY 1992 through FY 1997, according to the EIA Five-Year Forecast of Federal Information Systems Needs (based on preliminary data from over 40 federal agencies).

Information technology funding for the civil sector will increase approximately 2.1% annually in real growth over the forecast period while Department of Defense (DoD) funding for information technology will decline at a rate of 3% annually (Figure 6-G).

Both positive and negative factors are behind the forecast. Among the positive factors:

- significant pent-up demand for information technology requirements because computers and telecommunications networks help agencies stretch their budgets
- the Corporate Information Management (CIM) initiative is changing how DoD does business and this will present opportunities for industry
- Major initiatives in the Civil Agencies such as the Tax Systems Modernization program at the Internal Revenue Service (IRS), the Capital Improvement Plan at the Federal Aviation Administration (FAA), and the Global Climate Change program spanning numerous agencies
- The portion of information technology obligations available to industry continues to increase.

On the negative side:

- the continued specter of large deficits is squeezing discretionary spending for both defense and civil agencies, constricting information technology spending
- Force reductions and consolidation of facilities are reducing information technology obligations within DoD
- Spending on programs such as the Tax Systems Modernization and the Capital Improvement Plan, while providing a short term stimulus, will peak soon and then decline

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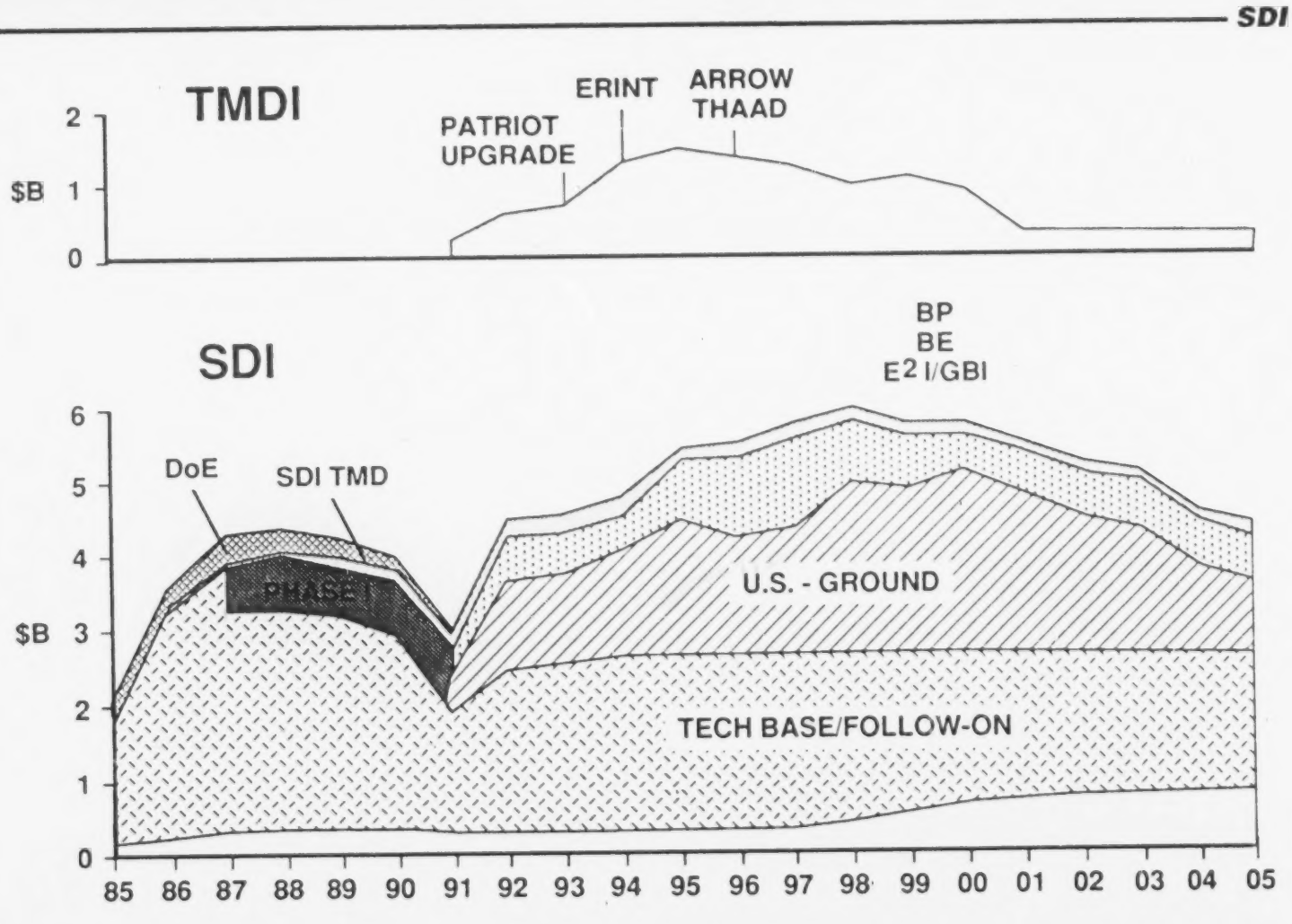
EIA TMD Funding Projections

Figure 6-E



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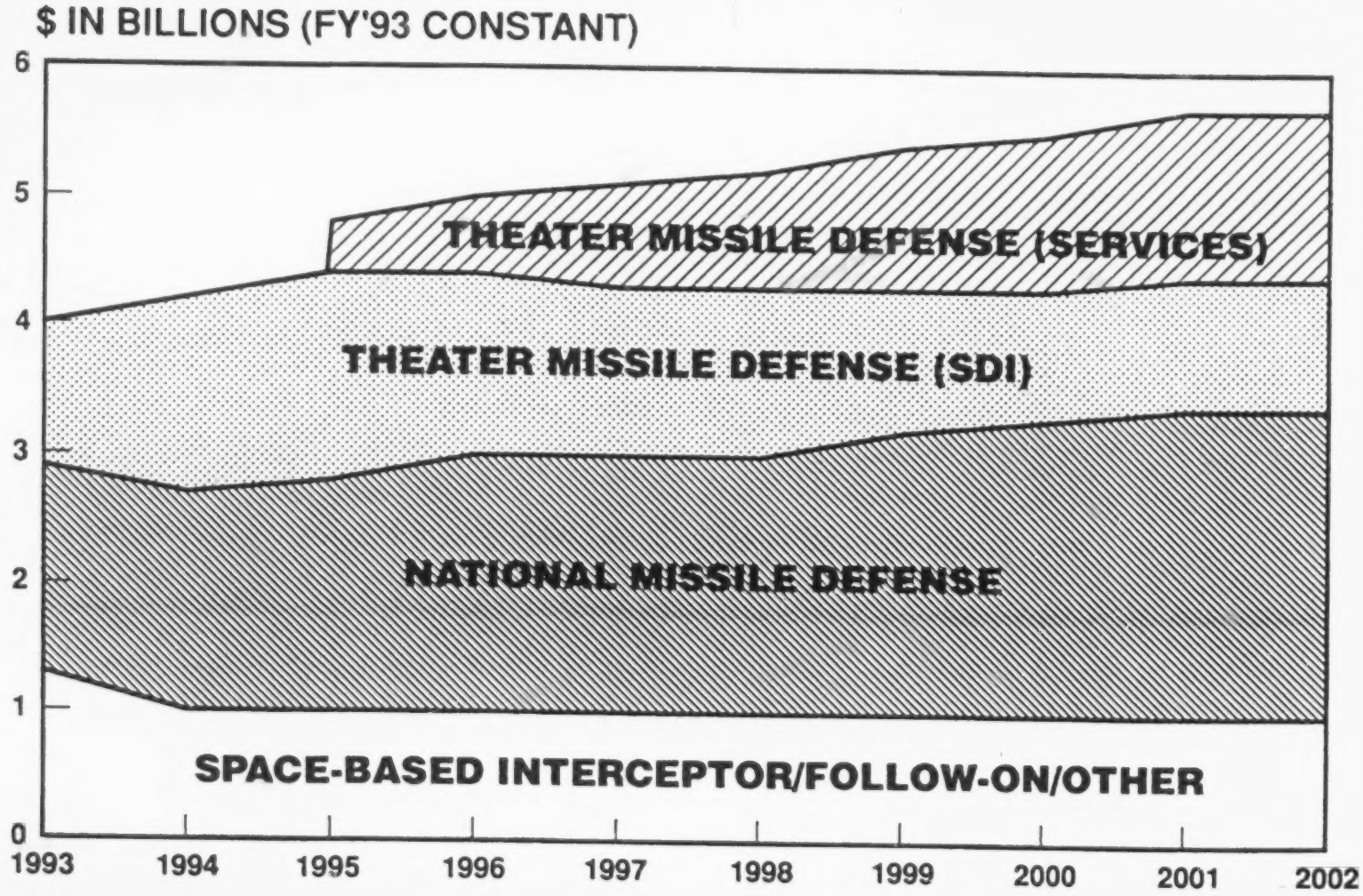
SDI/TMD Forecast

Figure 6-F



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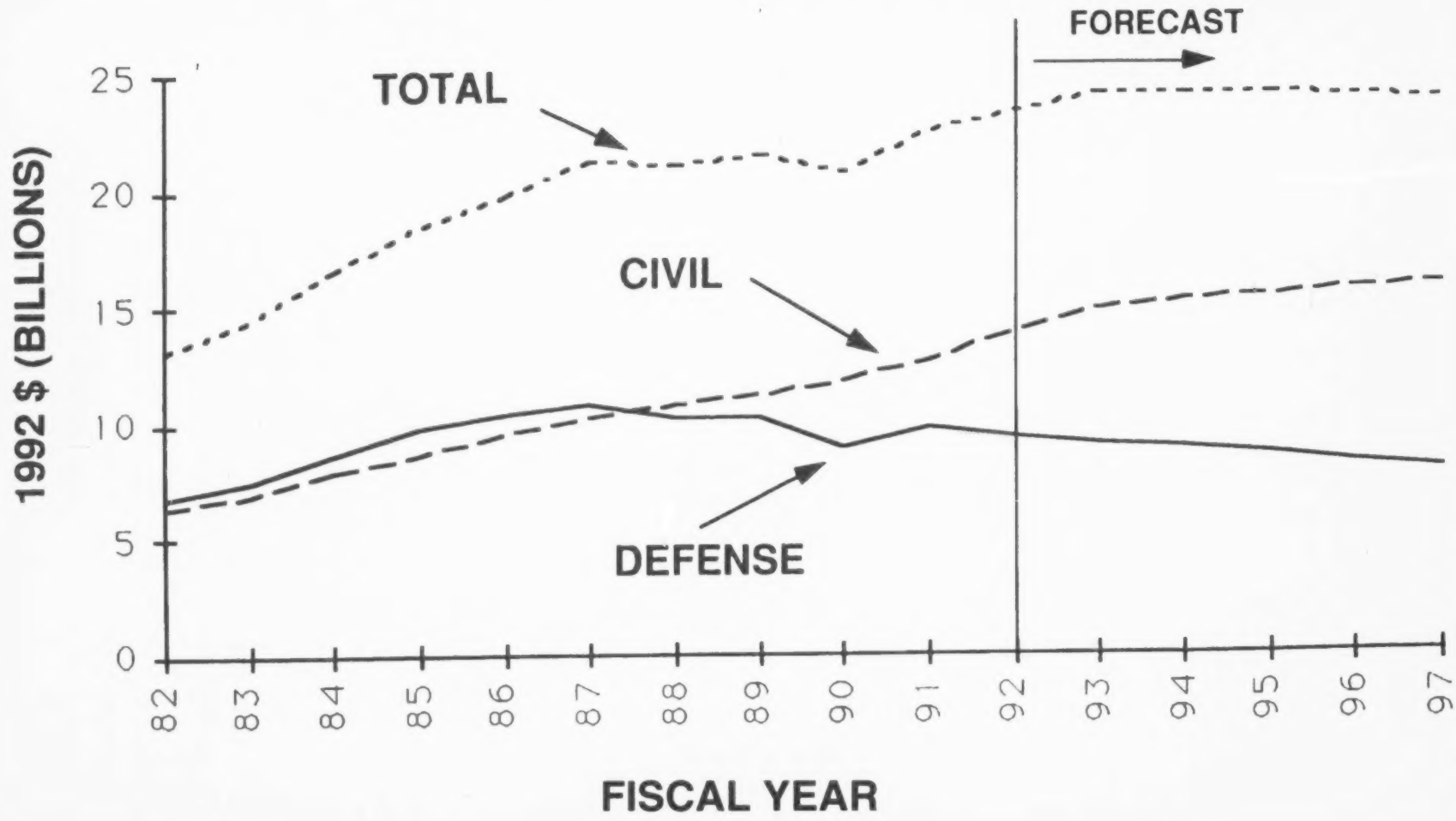
Federal Information Systems--Five-Year Forecast

TOTAL GOVERNMENT FORECAST

Figure 6-G



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- The large number of program slippages (which can be attributable to many causes, ie., cost, performance, management decisions, etc.) is reducing the obligations for information technology in many federal agencies.

The largest three agencies for federal information systems spending will shift significantly over the next five years. The three DoD Services will continue to have the largest information technology budget in FY 1992. However, by the end of the forecast period, the Departments of Treasury and Transportation will have the largest budgets for information technology (Figure 6-H). The portion of the federal information technology market that is available to industry will continue to grow, creating opportunities for contractors.

The Department of Treasury and Transportation will have the largest budgets for information technology...

* This unique EIA Forecast Conference is highly regarded within the electronics industry, and provides the most comprehenserve industry-prepared analysis and forecast for the federal information systems market... at the best price. The analysis is based on extensive research and is complemented with interviews conducted with government information technology officials. The study is prepared by key individuals form EIA member ccompanies who are professionals in the information technology industry.

CIVIL MARKET ANALYSIS

The FY 1993 Civil information technology budget of $15.6 billion will grow approximately 2.1% annually in real terms through FY 1997, according to the EIA Civil Market Analysis.

Among the Civil Agencies showing real growth in FY 1993 and presenting major contracting opportunities for industry are the Department of Transportation (DOT), the Department of Treasury, the National Aeronautics and Space Administration (NASA), the Department of Health and Human Services (HHS), the Department of Energy and the Department of Justice.

While growth in this market will be slowing, some agencies will be required to show cost recovery prior to obtaining approval from the Office of Management and Budget (OMB) for specific programs and the concept of a fee for service being introduced. In addition, there is a de-emphasis on technology per se, unless its introduction makes good business sense. Other trends included the Veteran's Administration adoption of the DoD Corporate Information Management (CIM) philosophy; and the general consensus among government information technologists to consolidate functionally-similar systems and piggy-back on existing systems where possible, to realize additional cost savings.

An effort is also on the way by many agencies to significantly improve customer service. The Internal Revenue Service (IRS), the Veteran's Administration, and the Social Security Administration are all looking at ways to make it easier for Americans to interact with their information systems.

The EIA review of Civil departments and agencies noted the heightened emphasis on law enforcement. The Federal Bureau of Investigation revitalization includes the National Crime Information Center (NCIC-2000) valued at $77 million and the Integrated Automated Finger Printing Identification System (IAFIS) valued at $500 million. Law enforcement activities were also identified within the Departments of Treasury, Transportation, Interior and State.

Another area of emphasis is transportation safety, as evidenced by the Department of Transportation's Intelligent Vehicle Highway System (IVHS) initiative.

The Internal Revenue Service (IRS), the Veteran's Administration, and the Social Security Administration are all looking at ways to make it easier for Americans to interact with their information systems.

Technology needs most commonly expressed by the civil agencies were in the areas of electronic imaging, digital scanners, local area networks, satellite communications, and geographical information systems.

Common messages conveyed from the government officials focused on the provision of open systems and Commercial-Off-The-Shelf (COTS) hardware and software solutions. The agencies desire solutions, not technology, and they continually emphasized

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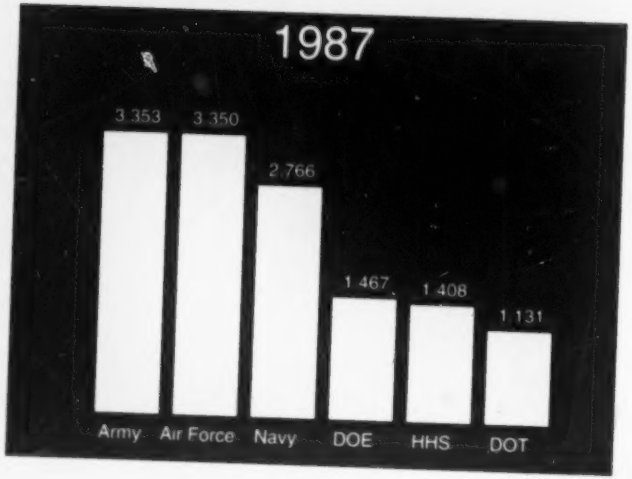
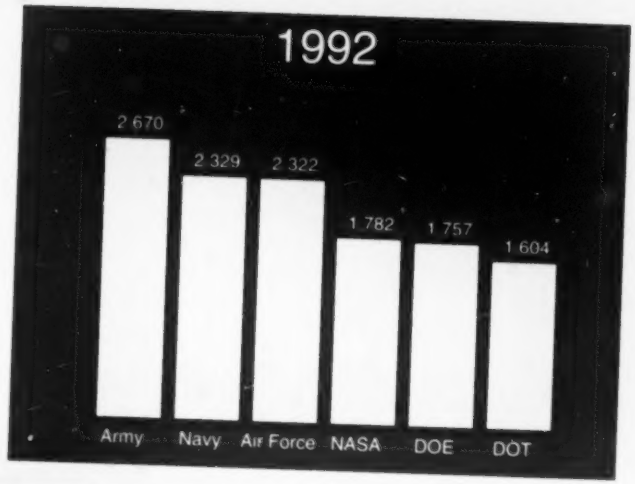
INFO TECH IS CHANGING FAST

Federal Information Systems----Five-Year Forecast

(1992 $ X Millions)





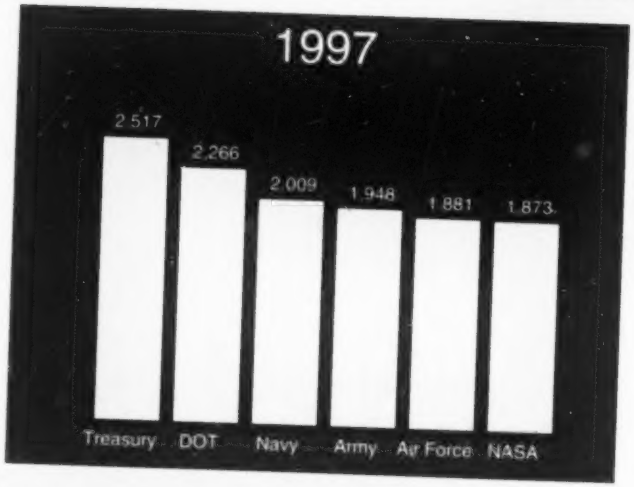


Figure 6-H

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the need for quality products and services. Common concern was expressed about the number of frivolous protests filed by industry which makes it harder to manage procurement.

DEFENSE MARKET ANALYSIS

Although the total number of business opportunities in the DoD is smaller and will remain flat or decline in the years immediately ahead, the defense budget remains large and change provides opportunities for those who are flexible, responsive and well informed, according to EIA. Information technology spending for DoD in FY 1992 totaled $9.46 billion and will decline approximately 3% annually in real terms through FY 1997.

Information technology funds will shift out of the Military Services and into the Defense Agencies, such as the Defense Information Systems Agency, the Defense Medical Support Activity and the Defense Finance and Accounting Service. The threat to our national security has changed dramatically. Responding to those threats and to problems evident during Desert Storm with a smaller force projected largely from the U.S., places a heavy emphasis upon technological superiority at affordable rates.

The defense budget remains large and change provides opportunities for those who are flexible, responsive and well informed.

CIM has been the center of attention in the defense information technology sector for the last two years. When the CIM principles take hold, it will produce a significant impact on the market and how contractors do business with the federal government. However, it appears that CIM's impact will occur much slower than originally expected.

The major trends and drivers for DoD are the budget, CIM, and reorganizations or consolidations. There is great emphasis on COTS products and technological superiority.

The major trends and drivers for DoD are the budget, CIM, and reorganizations or consolidations. There is great emphasis on COTS products and technological superiority. Top government executives have told us to stress quality and affordability, and they have encouraged better communication and cooperation with our government counterparts.

ELECTRONIC IMAGING

Electronic imaging applications are growing by the minute and are not limited to just office automation according to the EIA. Many view the federal market for electronic imaging to be focused on document storage and management. However, the federal market is broader than the paperless office concept; it ranges from fingerprints to medical imagery for diagnosis, to environmental monitoring, to many unique challenges to preserving our nation's history at the National Archives and Records Administration and the Library of Congress.

The EIA Electronic Imaging study provides a comprehensive overview of the electronic imaging technology and identifies applications and technologies in both the civil and defense sectors. This market is so broad that it is virtually impossible to isolate budgets for electronic imaging so as to accurately estimate federal spending.

The study findings indicate that federal agencies are quite risk averse when it comes to electronic imaging technology. Agencies want to buy COTS equipment, and if it is not available, procurement may just wait.

The study team identified a number of challenges to the industry that must be addressed if electronic imagery is to achieve its potential. Among the challenges are requirements for mass data storage, high capacity communications to transmit and receive imagery, and the ever present need for standards.

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FISCAL YEAR 1994 GOVERNMENT ELECTRONICS BUDGET

The Fiscal Year (FY) 1994 United States Budget submitted by President Clinton totals $1,517.2 trillion in budget authority (BA) and $1,515.3 trillion in outlays (Figure). Inflation adjusted spending is budgeted to rise 3% over the current year. Not factored in the budget: the $66 billion spending cut over the next five years to meet the spending plans recently endorsed by both the Hill and the Administration; or the cost of pending health care reform anticipated in this budget and targeted for May, 1993.

Discretionary spending shows a decrease versus FY93, with defense spending down 4.9% to $277.7 billion, and international outlays down 1.3% to $2.3 billion. Domestic spending is budgeted to increase 7.0% to $251.1 billion. Projections by the administration indicate that unemployment will be down to 5.7% at the end of FY97, inflation will be at 2.2% in FY96, and that the gross domestic product will grow at a 3% rate in 1994.

The NASA Budget

The National Aeronautics and Space Administration (NASA) budget for FY94 is up from $14.3 billion in 1993 to $15.3 billion, including:

- $7.7 billion for Research and Development
- $5.3 billion for Space Flight, Control and Data Communications
- $545 million for Construction of Facilities
- $1.7 billion for Research and Program Management, and
- $15 million for Inspector General functions.

Over the long pull, the FY94 budget projection shows a decrease of $23.8 billion through FY98. This figure is down from the Bush FY93 budget figures through 1998. Clinton is seeking a less expensive Space Station; the instant budget has $2.1 earmarked for restructuring the Space Station FREEDOM project, which is now estimated to cost approximately $30 billion.

The Department of Transportation

DOT's FY94 budget request is for $40.2 billion, 10.2% above the amount enacted and 9.1% more than the amount requested for FY93. DOT targets 71% of spending for infrastructure investment, with the goal of leading to improvements in transportation speed, reliability and cost-effectiveness, which is cited as important to competitiveness and job creation.

Transportation technology will be enhanced through investments of $140 million in high-speed rail and maglev trains, $226 million for Intelligent Vehicle-Highway Systems (IVHS) and $456 million for improvements in air traffic control. The DOT R&D budget of nearly $700 million is up 6.3% over 1993, more than twice the overall federal R&D growth rate.

The Department of Energy Budget

The DOE FY94 budget reflects a modest increase from $19 billion in FY93 to $19.6 billion. For national defense needs, the budget drops from $7.2 billion to $5.9 billion with $4.7 billion of that total being earmarked specifically for Defense Programs. Science and technology funding increases from $2.7 billion to $2.9 billion. The environmental restoration and waste management budget request, which provides for cleanup activities at defense production sites, increases from $5.5 billion to $6.5 billion. Spending for energy-related activities increases from $3.4 billion to $3.9 billion.

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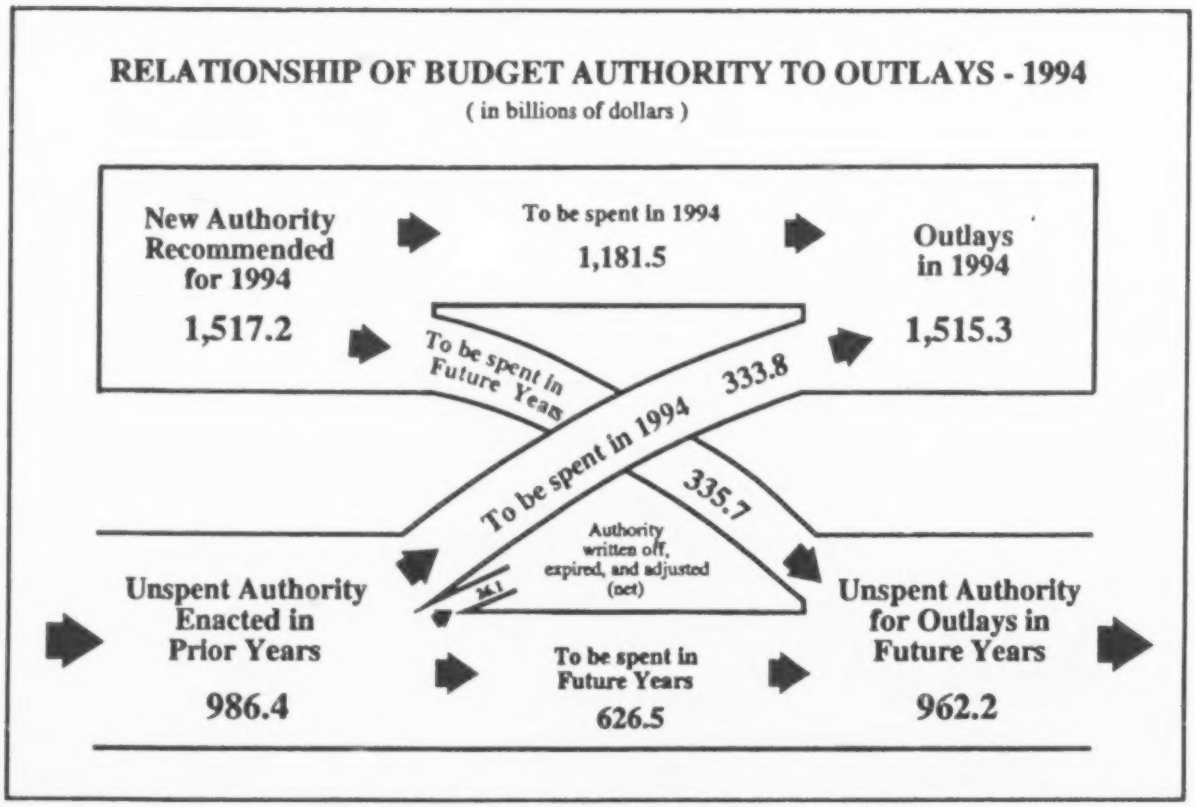
DoD R&D

The FY 1994 Department of Defense budget proposed by President Clinton totals $250.7 billion. Of this total, $38.6 billion is allocated for Research and Development (R&D) programs. The defense budget stresses initiatives and strategies to meet the four dangers highlighted in its new global security environment: regional security, weapons of mass destruction, democratic security, and economic security.

RELATIONSHIP OF BUDGET AUTHORITY TO OUTLAYS - 1994

($ Billions)



SOURCE: Budget of the United States Government, p. 98

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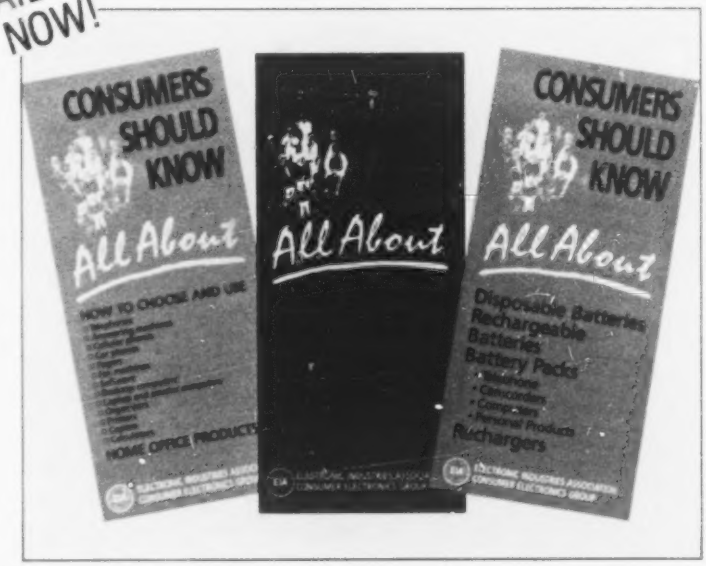
The R&D budget includes funding to protect development of future generation weapon systems. Significant defense R&D programs include the:

- F-22
- V-22
- F/A-18E/F
- A/F-X
- Longbow
- Comanche Helicopter
- New Attack Submarine
- Strategic Defense Initiative
- MILSTAR Satellite
- Spacelifter

CONSUMERS SHOULD KNOW PAMPHLETS

AVAILABLE NOW!



- On purchase, use and care of stereo television, VCRs, camcorders, compact disc players, computers, printers, modems, telephones, answering machines, cellular telephones, and more
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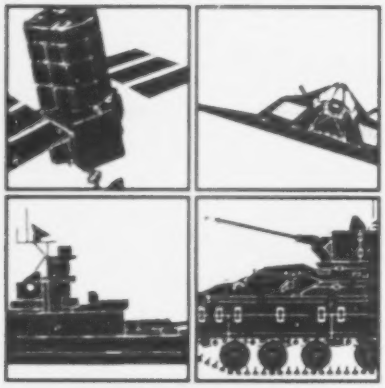
PRODUCTS AND SERVICES

GOVERNMENT DIVISION



TEN-YEAR FORECAST OF DEFENSE ELECTRONICS

The "Ten-Year Forecast of Defense Electronic Opportunities" features the EIA Annual Ten-Year Forecast of DoD and NASA markets, which reviews budget trends and provides a bottom-up analysis of military hardware accounts. Also included in the publication is a briefing on International Defense Electronics in the Pacific Rim and an analysis of over 350 DoD/NASA missions, programs, technology issues, trends and opportunities. In addition, analyses and forecasts of specific markets are presented. Markets reviewed in 1992 included C3/Situational Awareness; Special Operations; and Strategic Defense Initiative/Theater Missile Defense, Global Protection Against Limited Strike (SDI/TMD/GPALS). Updated annually in October.

Price: $175 (EIA Government Division members), $395 (non-members).

Contact: Kelly Curtis (202) 457-8748.

FIVE-YEAR FORECAST OF FEDERAL INFORMATION SYSTEMS

The EIA "Five-Year Forecast of Federal Information Systems Needs" contains a forecast and market research data on the information technology market across the federal government. An overview of ADP, computer and telecommunications requirements and opportunities is provided in the Defense and Civil Agency Market analyses. Also included in the report is a special market study on Electronic Imaging and presentations by key government officials. The keynote address was given by Senator Al Gore (D-TN). Updated annually in June.

Price: $95 (EIA Government Division members), $180 (non-members).

Contact: Kelly Curtis (202) 457-8748.

GOVERNMENT MARKET PLANNING INFORMATION (GMPI) SERVICE

The GMPI Service is a biweekly publication of the EIA Government Division Requirements Council. Each issue contains a collection of various administration, congressional and other government documents found to be of assistance and interest to electronic industry market planning executives. Significant focus is given to the federal budget process and federal government reports. One-year subscription: $325 (EIA Government Division members), $650 (non-members eligible for membership/non-renewable), $545 (associate organizations ineligible for Government Division membership, i.e. financial, consulting, educational). Sample issues available upon request. Individual issues are also available for $50 per copy.

Contact: Mary Lamb (202) 457-4943.

R-1/P-1 DATABASE

The EIA R-1 (Research, Development, Test and Evaluation) and P-1 (Procurement) "Defense Budget Database" is an electronic spreadsheet of the DoD R-1/P-1 budget documents. In addition to FY 1994 budget information, the database contains historical budget information for FYs 1983-1992, DoD mission area assignments, and EIA hardware category assignments that correspond with the EIA Ten-Year Forecast. Updated annually in conjunction with the President's submission of the federal government's budget. Available in the following formats: 3 1/2" disks for IBM or MAC. Specify format when ordering.

Price: $105 (EIA Government Division members), $195 (non-members).

Contact: Kelly Curtis (202) 457-8748.

TECHNOLOGY AND BUDGET CONFERENCE REPORT

"Technology Survival Guide: Competing for Dollars and Market Position" is the theme of the EIA 22nd Annual Technology and Budget Conference Report. The report includes an industry-prepared overview of the DoD/NASA Research and Development Budget; an assessment of Government Technology Efforts; presentations by senior government executives from CBO, DDR&E, ARPA, SDIO, the Services, and NASA; special studies on Dual-Use Technologies and the Special Operations Shadow Market; a Congressional Staff Panel, a Wall Street Perspective; and a point-counterpoint debate on the Industrial Base Drawdown. Presentations by Congresswoman Patricia Schroeder (D-CO) and Gordon Adams of OMB are also included. Updated annually in March. Price: $105 (EIA Government Division members), $195 (non-members). Contact Kelly Curtis (202) 457-8748.

"OPERATION DESERT STORM: A Triumph of Technology"

A nine-minute video tape that celebrates the triumph of technology in Operation Desert Storm and honors the members of our Armed Forces. Available in VHS format, the tape notes the importance of electronics to national economic competitiveness and aims to encourage people to pursue academic degrees in technical fields.

Price: Civic, veterans and educational groups may borrow the tape free. Others may purchase the tape for $6.50.

Contact: Arlene Allen (202) 457-4940.

GOVERNMENT PROCUREMENT RELATIONS COUNCIL Value Engineering Management Bulletin No. 7:

A compendium of contested value engineering contract actions; Comptroller General Decision; Armed Services Board of Contract Appeals Decision; U.S. Court of Claims Decisions. March 1991 Edition.

Price: $15.00 Members; $25.00 Non-members.

Contact: Simone Smith (202) 457-4999

DEFENSE CONTRACT TERMINATION GUIDE -Third Edition:

A guide to assist prime contractors and subcontractors in the successful administration of terminations for the convenience of the government.

Price: $25.00 Members; $40.00 Non-Members.

Contact: Simone Smith (202) 457-4999.

U.S. BILATERAL TRADE

TOTAL U.S. ELECTRONICS
($ Millions), 1992

IMPORTS		% of Total	EXPORTS		% of Total
Japan	30,569	34.6%	Canada	12,945	16.6%
Singapore	8,172	9.2%	Japan	8,086	10.4%
Taiwan	7,892	8.9%	U.K.	6,007	7.7%
Canada	6,444	7.3%	Mexico	5,770	7.4%
S. Korea	5,656	6.4%	Germany	5,300	6.8%
Mexico	5,772	6.5%	Singapore	3,841	4.9%
Malaysia	5,471	6.2%	Netherlands	3,224	4.1%
China	2,673	3.0%	Taiwan	3,254	4.2%
Germany	2,539	2.9%	France	2,888	3.7%
U.K.	2,357	2.7%	S. Korea	2,700	3.5%
Other	11,002	12.4%	Other	23,941	30.7%

SOURCE: U.S. Department of Commerce, compiled by EIA Marketing Services Deparment.

IN THIS CHAPTER

- ***The Americas***
  - *NAFTA*
- ***Asia***
  - *Defense Electronic Opportunities in East Asia*
  - *Special Report: Asian Defense Electronics*
- ***Europe***
  - *European Community*

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THE AMERICAS

NAFTA

The North American Free Trade Agreement (NAFTA), between the U.S., Canada and Mexico was signed by President George Bush in December 1992. The NAFTA will eliminate trade and investment barriers and integrate markets with over 360 million people and $6 trillion in annual output. The NAFTA still must receive approval from the U.S. Congress in 1993.

While President Clinton has noted that he supports NAFTA, "side agreements" on labor, the environment and import surges must be completed before the agreement is submitted to Congress for final approval. The planned effective date of the agreement is January 1, 1994.

The NAFTA should only improve the environment for trade in North America and will likely boost export demand for U.S. goods and services. The NAFTA will ensure that the benefits of free trade accrue to North American companies, through rules of origin and duty drawback provisions, and protection of intellectual property rights. Tariff reduction will also allow greater access to markets.

In general, Mexican tariffs average 10 percent and are two-and-a-half times that of U.S. tariffs. Mexican tariffs on 40 percent of U.S. dutiable exports for electronic equipment (including computer storage units, magnetic media, and photocopier parts) will be eliminated immediately, 50 percent will be phased out in 5 years (including TVs, computers, and telephone equipment), and the remainder in 10 years (including switches and electronic circuit breaking equipment).

Since Mexico began to lower trade barriers in 1986, U.S. exports have more than doubled from a 1987 total of $2.4 billion to a 1992 total of $5.7 billion, a compound annual growth rate of 7%. The trade balance with Mexico in electronics has improved from a 1987 $1 billion deficit to almost even in 1992.

Canada and Mexico combined account for ***one quarter of the global market for U.S. electronics exports***. Canada is the largest export market for the U.S. electronics industry, at almost $13 billion in 1992. Mexico is the fourth largest U.S. export market, surpassing Germany in 1992, with $5.7 billion in exports. Electronic exports to Mexico and Canada represent over 14% of total U.S. merchandise exports.

Electronic component exports to Mexico have more than doubled over the past five years to $1.4 billion in 1992, and constitute the largest electronics export sector. Computers and peripherals is the second largest export sector at $1.3 billion in 1992. U.S. exports to Canada are led by computers and peripherals at $4.7 billion in 1992, followed by solid state products ($3.1 billion).

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ARGENTINA

ARGENTINA: ECONOMIC PROFILE

POPULATION: 32.7 million

	1989	1990	1991
GDP ($ billions)	n/a	n/a	$101.2
Real GDP Growth (%)	- 4.5	0.4	6.0
Real Per Capita GDP ($)	n/a	n/a	$3,100.0
Consumer Price Inflation (%)	3,079.8	2,314.7	172.8
Exchange Rate (Australes per U.S. $)	423	4,876	9,536

Note: On January 1, 1991, the peso replaced the austral; 1 peso=A10,000.
SOURCE: U.S. Department of Commerce

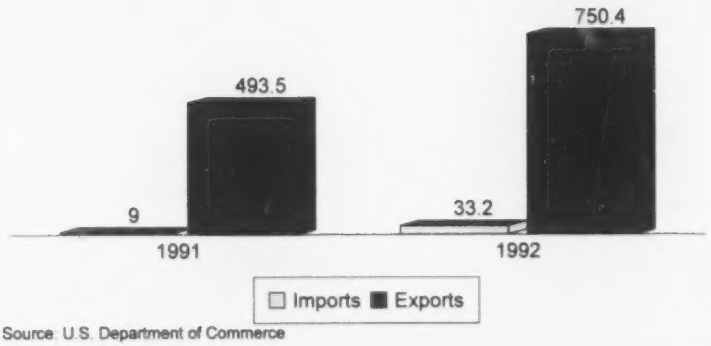
ARGENTINA: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.0	0.0	1.5	8.8
Passive Components	0.6	0.6	50.9	48.2
Solid State Products	0.1	0.0	14.6	26.3
Consumer Electronics	0.0	0.0	64.6	91.6
Telecommunications	1.9	0.3	57.0	151.3
Other Communications	0.0	0.0	2.0	5.4
Computers & Peripherals	6.3	31.9	254.5	351.9
Industrial Electronics	0.1	0.4	23.3	32.2
Electromedical Electronics	0.0	0.0	25.1	34.7
TOTALS	9.0	33.2	493.5	750.4

SOURCE: U.S. Department of Commerce

U.S. Electronics Trade With Argentina

Millions of U.S. Dollars



Source: U.S. Department of Commerce

BRAZIL

BRAZIL: ECONOMIC PROFILE

POPULATION: 150.0 million

	1990	1991	1992
GDP (current U.S. $ billions)	399	418	404
GDP Per Capita (current U.S. $)	2,489	na	na
Real GDP Growth Rate (%)	(4.0)	1.2	-0.9
Inflation (% Dec.-Dec.)	1,794	458	na
Unemployment (%)	3.9	4.2	na
Avg. Exchange Rate (Cruzeiros per U.S. $)	67.67	408.60	4,506.40

SOURCE: U.S. Department of Commerce

BRAZIL: U.S. IMPORTS/EXPORTS (U.S. $ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.0	0.0	5.2	4.4
Passive Components	61.3	55.7	251.5	195.2
Solid State Products	5.1	5.4	110.1	76.6
Consumer Electronics	65.8	89.3	48.3	35.9
Telecommunications	3.1	10.7	70.1	115.2
Other Communications	0.2	0.8	4.8	7.9
Computers & Peripherals	54.0	90.3	404.0	534.4
Industrial Electronics	12.5	20.9	60.3	79.7
Electromedical Electronics	0.1	0.1	58.3	77.1
TOTALS	202.1	273.2	1,012.6	1,126.4

SOURCE: U.S. Department of Commerce

BRAZIL: CONSUMER ELECTRONICS* (U.S. $ millions)

	1989	1990	1991 (est.)
Imports	1,647	1,650	1,680
Production	250	230	210
Exports	22	18	16

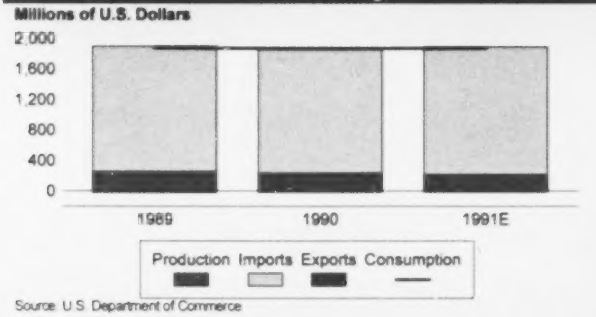
* Consumer electronics includes audio and video hardware, telephones, calculators, home office and business equipment, mobile electronics, watches, musical instruments and microwave ovens.

SOURCE: U.S. Department of Commerce

U.S Electronics Trade With Brazil

Source: U.S. Department of Commerce

Brazil's *Consumer Electronics** Industry



Source: U.S. Department of Commerce

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CANADA

CANADA: ECONOMIC PROFILE

POPULATION: 27 million

	1990	1991	1992
GDP Growth Rate (%)	5.6	(1.7)	0.7
Average Unemployment Rate (%)	8.1	10.3	11.3
Consumer Price Index (%)	4.8	5.6	1.5
Exchange Rate (Canadian $ per U.S. $)	1.17	1.15	1.21

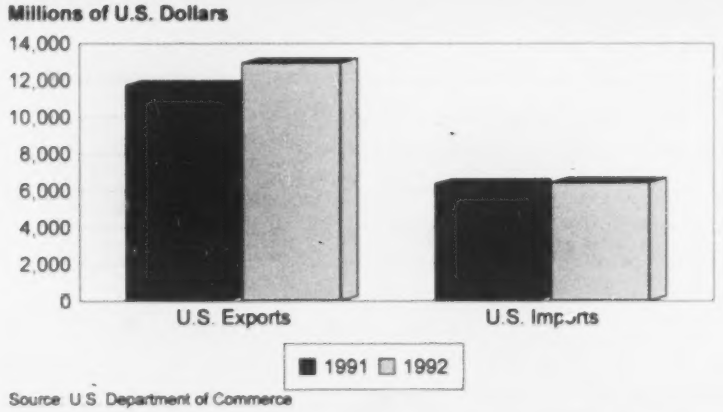
SOURCE: U.S. Department of Commerce

CANADA: U.S. IMPORTS/EXPORTS (U.S. $ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	14.8	10.1	75.1	80.5
Passive Components	1,417.5	788.2	1,632.7	1,345.0
Solid State Products	1,420.7	1,728.5	2,701.4	3,098.0
Consumer Electronics	66.5	62.3	778.2	797.4
Telecommunications	775.3	995.7	886.1	1,354.5
Other Communications	165.2	212.2	174.0	266.0
Computers & Peripherals	2,089.3	2,197.7	4,301.2	4,712.2
Industrial Electronics	397.2	417.8	920.4	1,008.4
Electromedical Electronics	30.4	32.0	258.9	283.6
TOTALS	6,376.9	6,444.5	11,728.0	12,945.6

SOURCE: U.S. Department of Commerce

Canada-U.S. Electronics Trade



Source: U.S. Department of Commerce

MEXICO

MEXICO: ECONOMIC PROFILE

POPULATION: 85.6 million

	1990	1991	1992[e]
GDP (current $ billions)	238.0	280.0	317.0
Real GDP Growth Rate (%)	3.9	3.6	3.5
GDP Per Capita (current U.S. $)	2,890.0	3,333.0	3,700.0
Inflation (%)	29.9	18.8	12.0
Avg. Exchange Rate (Pesos per U.S. $)	2,807.0	3,006.0	3,115.0

[e]-estimate
SOURCE: U.S. Department of Commerce

MEXICO: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	6.0	5.9	215.9	288.5
Passive Components	1,979.8	2,052.7	1,694.0	1,402.3
Solid State Products	333.7	362.6	440.9	562.7
Consumer Electronics	1,450.4	1,636.0	424.3	502.6
Telecommunications	283.3	409.7	482.1	1,103.3
Other Communications	69.9	101.0	29.8	68.2
Computers & Peripherals	752.8	923.5	1,080.6	1,252.6
Industrial Electronics	145.9	179.0	397.8	461.1
Electromedical Electronics	81.8	100.3	110.4	128.0
TOTALS	5,103.6	5,770.7	4,875.8	5,769.3

SOURCE: U.S. Department of Commerce

U.S. Electronics Trade With Mexico

Millions of U.S. Dollars

Source: U.S. Department of Commerce

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ASIA

DEFENSE ELECTRONICS OPPORTUNITIES IN EAST ASIA

The East Asian nations of the Pacific Rim will remain a large, but essentially flat market for U.S. defense electronics during the next five years, according to a study on the defense electronics market in the Pacific Rim. The significant market in the Pacific Rim for U.S. defense technology--those countries with defense requirements and money to spend and to whom the U.S. Government will allow U.S. industry to sell--consists of eight countries: Japan, South Korea, Taiwan, Australia, Singapore, Indonesia, Thailand, and Malaysia.

Although the market will remain large, U.S. industry will lose some market share in the coming years to increasing European and Israeli competition, indigenous production, and the desire by some major U.S. customers to diversify sources of supply.

(For additional information see "Special Report" sections in this chapter. Or, contact Kelly Curtis at 202/457-8748 for information on the "EIA Ten-Year Forecast of Defense Electronic Opportunities --FYs 1993-2002.")

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AUSTRALIA

AUSTRALIA: ECONOMIC PROFILE

POPULATION: 17.5 million

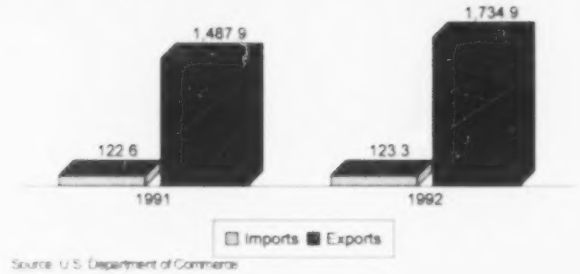
	1990	1991	1992e
GDP (current U.S. $ billions)	298	290	294
Real GDP Growth Rate (%)	1.6	-1.3	1.5
GDP Per Capita ($)	17,013	16,576	16,825
Inflation (%)	8.3	5.3	2.8
Unemployment (%)	9.1	10.5	10.0
Avg. Exchange Rate (Australian $ per U.S. $)	1.21	1.23	1.30

e-estimate
SOURCE: U.S. Department of Commerce

SPECIAL REPORT: DEFENSE ELECTRONICS

Defense of Australia's northern and western approaches and regional security concerns guide the defense strategy and translate into requirements of rapidly deployable, well-armed forces; mobile hardware platforms; and acvanced intelligence, surveillance, and information processing capabilities. The study found that U.S. companies dominate the Australian defense market, a procurement account of $1.9 billion per year with prospects for increased expenditure on capital equipment and technology over the next five years. However, self-reliance concerns favor those U.S. firms that are able to establish a local subsidiary, team with a local prime, or at least help assure local capabilities for repair and maintenance.

U.S. Electronics Trade With Australia



AUSTRALIA: U.S. IMPORTS/EXPORTS (U.S. $ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.0	0.0	5.3	5.8
Passive Components	11.5	5.3	92.3	59.4
Solid State Products	11.4	4.3	66.3	61.8
Consumer Electronics	1.1	1.5	30.5	31.5
Telecommunications	15.0	7.0	111.8	251.5
Other Communications	2.4	1.1	29.7	66.8
Computers & Peripherals	58.9	75.5	935.0	1,021.1
Industrial Electronics	13.6	17.4	117.0	127.8
Electromedical Electronics	8.7	11.2	100.0	109.2
TOTALS	122.6	123.3	1,487.9	1,734.9

SOURCE: U.S. Department of Commerce

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CHINA

CHINA: ECONOMIC PROFILE
POPULATION: 1.158 billion

	1989	1990	1992
Real GNP Growth Rate (%)	3.5	5.0	7.0
GNP Per Capita (current $)	376.8	318.5	317.6
Inflation (%)	17.5	2.1	2.9
Unemployment (%)	2.6	2.5	na
Avg. Exchange Rate (Yuan per U.S. $)	3.7	4.7	5.3

SOURCE: U.S. Department of Commerce

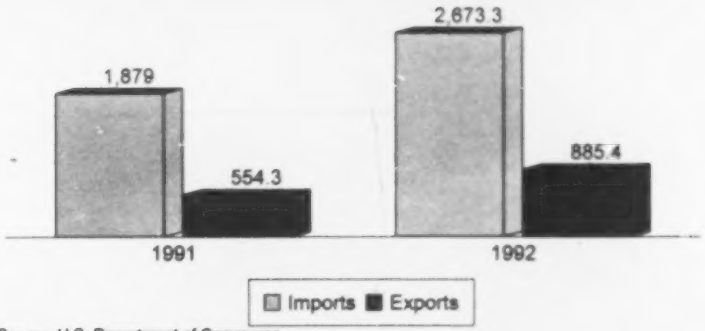
CHINA: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	5.1	5.1	2.8	1.5
Passive Components	166.4	279.0	36.8	40.7
Solid State Products	1.8	4.8	8.3	9.7
Consumer Electronics	959.9	1,186.2	4.8	6.3
Telecommunications	481.7	576.5	119.9	304.0
Other Communications	47.2	56.5	25.3	64.1
Computers & Peripherals	207.9	541.8	133.5	172.0
Industrial Electronics	7.2	18.8	155.1	199.8
Electromedical Electronics	1.8	4.6	67.8	87.3
TOTALS	1,879.0	2,673.3	554.3	885.4

SOURCE: U.S. Department of Commerce

U.S. Electronics Trade With China

Millions of U.S. Dollars



Source: U.S. Department of Commerce

CHINA

CHANGE IN OWNERSHIP OF DURABLE CONSUMER GOODS IN CHINA

	1985	1990
Ownership Per 100 Persons		
Television Receivers	6.6	16.2
Tape Recorders	3.5	10.4
Radio Broadcast Receivers	22.8	22.0

SOURCE: Chinese Statistics Yearbook 1991

CHINA

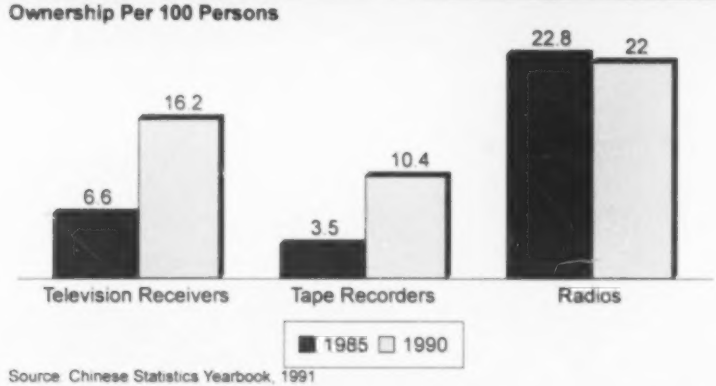
For the electronic industry, U.S.-China relations are becoming an increasingly vital issue. With a booming yet developing economy, China's vast resources and a market of over one billion people creates enormous potential for the range of electronic products. However, there are concerns that excessive growth and expansion in China may create broader political, economic and social problems.

U.S. trade with China totalled over $3.5 billion in 1992, with $885.4 million in U.S. exports and $2.67 billion in imports. U.S. exports grew over 62% from 1991, but imports from China rose over 70%. The largest export market in China is telecommunications, which has the potential for further significant growth, because of the country's vast needs in infrastructure and development. Industrial electronics and computers and peripherals are the second and third largest U.S. export markets, respectively.

U.S. imports from China are dominated by consumer electronics at $1.18 billion, with telecommunications ($576 million) and computers and peripherals ($541 million) as the second and third largest import categories. Relative to 1991, China moved ahead of Germany and the U.K., and from tenth to eighth, in the ranking of the largest suppliers to the U.S. electronics market.

Continuing trade frictions and a rising U.S. trade deficit strain U.S.-China relations. Concern with lack of protection of intellectual property rights led to a January 1992 U.S.-China agreement to improve Chinese practices in protection of intellectual property. A market access "301" investigation over Chinese practices in standards, quotas and licensing resulted in successful negotiations in October 1992, and commitments on the part of the Chinese to remove barriers and improve trade practices.

Ownership of Selected Durable Consumer Goods In China



Source: Chinese Statistics Yearbook, 1991

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CHINA

CHINA: IMPORT & EXPORT VALUE OF ELECTRONIC PRODUCTS 1990 ($ millions)

	IMPORTS	EXPORTS
Wire Telephone & Telegraph Equipment	339.72	87.13
Telephone Sets	5.68	78.61
Wireless Telegraph, Telephone Transmitter & Receivers	157.30	18.52
Wireless Navigation, Remote Control & Radar Equipment	73.61	1.20
TV Sets (inclusive monitor & complete set of assemblies)	103.47	518.96
Colour TVs	101.82	405.12
B/W TVs	1.65	113.84
Radio	0.22	53.96
Radio Cassette Recorders, Record Players, Dictating Machines	64.26	601.41
Video Cassette Recorders	34.04	26.50
Video Cassette Players	3.28	2.65
Electronic Computers	372.39	174.40
Electronic Instruments and Installations	551.40	80.17
Medical Electronic Equipment	159.89	18.37
Cameraing Electronic Devices	5.74	17.37
Colour TV Picture Tubes	350.16	10.72
B/W TV Picture Tubes	40.69	1.45
Integrated Circuits	144.49	8.68

SOURCE: "Statistics Monthly Journal", December 1990, Administration of the Custom

CHINA: INDUSTRIAL OUTPUT VALUE ($ millions)

	1988	1989	1990
Communication and Navigation Equipment	1,415.9	1,577.6	1,296.8
Broadcast & TV Equipment	269.8	252.6	190.2
Consumer Electronics Products	7,847.7	7,596.6	6,250.6
Semiconductor Discrete Devices	893.1	1,042.6	803.8
Integrated Circuits	240.6	113.5	119.3
Electron Vacuum Device Industry (Total)	625.6	788.3	932.5
Electron Vacuum Device Industry (Picture Tubes)	482.3	543.4	744.4
Electronic Components			
Capacitors	814.9	769.0	746.8
Resistors & Potentiometers	379.0	426.7	344.9
Magnetic Components & Materials	409.6	516.0	473.4
Transformers	394.1	347.0	249.5
Electronics Ceramics & Components	291.8	320.1	233.9
Quartz Crystal Components	111.9	139.5	101.5
Electromechanical Components			
Connectors	265.6	309.1	344.9
Control Elements	78.1	88.7	92.1
Audio Components	253.4	247.9	233.5
Electronic Equipment Meters	28.7	11.8	10.7
Chemical & Physical Power Sources	47.9		52.6
Electronics Wires/Cables & Wire Rods	176.2	234.0	187.3
Printed Circuit Boards	110.3	184.7	193.5

na - Not available.
SOURCE: China Electronics Industry Yearbook, 1992

HONG KONG

HONG KONG: ECONOMIC PROFILE
POPULATION: 5.8 million

	1989	1990	1991
GDP (current U.S. $ billions)	63.6	71.0	81.0
Real GDP Growth (%)	2.7	2.8	3.8
GDP Per Capita (current U.S. $)	11,046	12,244	13,775
Inflation Rate (CPI) (%)	10.1	9.8	12.5
Unemployment Rate (%)	1.4	1.6	2.0
Avg. Exchange Rate (HK$ per U.S. $)	7.80	7.79	7.74

SOURCE: U.S. Department of Commerce

HONG KONG: U.S. IMPORTS/EXPORTS (U.S. $ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.4	0.2	34.1	11.6
Passive Components	301.0	299.9	135.2	139.9
Solid State Products	276.3	372.0	760.1	966.7
Consumer Electronics	139.7	159.5	59.6	80.4
Telecommunications	204.8	182.9	128.9	205.0
Other Communications	27.1	24.2	11.3	18.0
Computers & Peripherals	652.2	709.0	453.8	614.2
Industrial Electronics	10.4	11.3	87.8	118.9
Electromedical Electronics	11.8	12.8	43.1	58.3
TOTALS	1,623.7	1,771.8	1,713.9	2,213.0

SOURCE: U.S. Department of Commerce

U.S Electronics Trade With Hong Kong

Millions of U.S. Dollars

Source: U.S. Department of Commerce

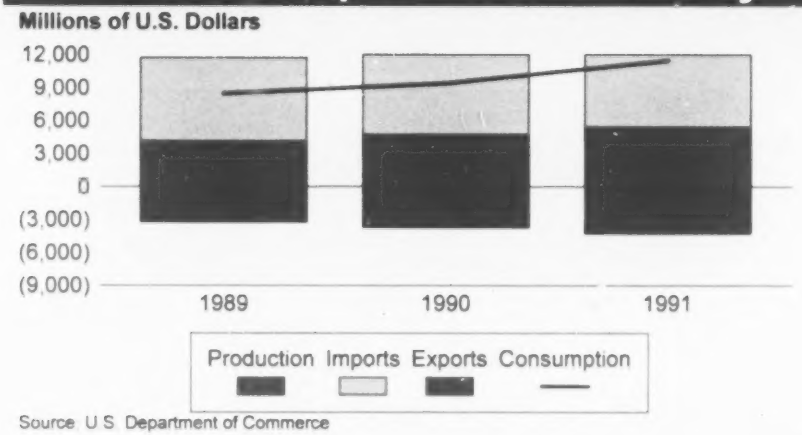
HONG KONG

HONG KONG: ELECTRONIC PARTS & COMPONENTS (U.S. $ million)

	1989	1990	1991
Imports	7,627.6	8,436.5	10,389.0
Production	4,086.0	4,703.5	5,398.5
Exports	3,268.6	3,762.8	4,318.8

SOURCE: U.S. Department of Commerce

Hong Kong's Electronic Parts And Components Industry



Source: U.S. Department of Commerce

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INDIA

INDIA: ECONOMIC PROFILE

POPULATION: 855 million

	1990	1991	1992
GDP (current $ billions)	295.2	247.9	236.9
GDP Per Capita (current $)	352.7	290.0	271.4
Real GDP Growth Rate (%)	5.5	1.8	4.0
Unemployment (%)	21.0	22.0	22.0
Avg. Exchange Rate (Rupees per U.S. $)	17.5	22.7	25.9

SOURCE: U.S. Department of Commerce

INDIA: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.1	0.3	1.6	2.7
Passive Components	3.9	12.0	17.0	21.4
Solid State Products	4.4	3.5	25.9	27.3
Consumer Electronics	0.7	0.8	2.4	2.8
Telecommunications	0.7	3.7	16.4	31.2
Other Communications	0.0	0.0	7.6	14.4
Computers & Peripherals	6.5	10.5	62.4	56.0
Industrial Electronics	0.9	1.4	56.7	50.9
Electromedical Electronics	0.1	0.2	25.9	23.2
TOTALS	17.3	32.4	215.9	229.9

SOURCE: U.S. Department of Commerce

INDIA: ELECTRONIC COMPONENTS ($ millions)

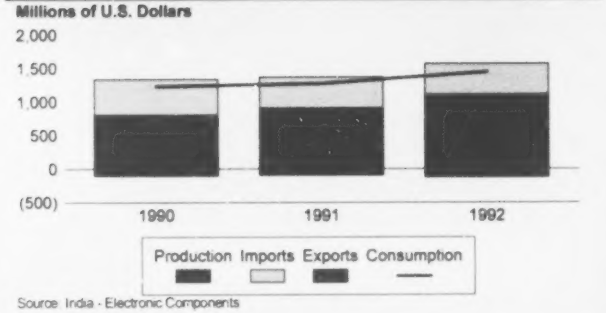
	1990	1991	1992[e]
Imports	540.0	467.3	464.3
Production	800.0	903.8	1107.1
Exports	107.0	96.2	125.0

[e]-estimate
SOURCE: U.S. Department of Commerce

U.S Electronics Trade With India

Source: U.S. Department of Commerce

India's Electronic Components Industry



Source: India - Electronic Components

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INDONESIA

INDONESIA: ECONOMIC PROFILE

POPULATION: 185 million

	1990	1991	1992[e]
GDP (current U.S. $ billions)	107.1	116.1	126.1
Real GDP Growth Rate (%)	7.3	6.8	6.0
GDP Per Capita ($)	599	638	682
Inflation (% change, CPI)	9.5	9.5	8.0
Unemployment (%)	3.0	2.4	2.5
Avg. Exchange Rate (Rupiah per U.S. $)	1,843	1,950	2,047

[e]-estimate
SOURCE: U.S. Department of Commerce

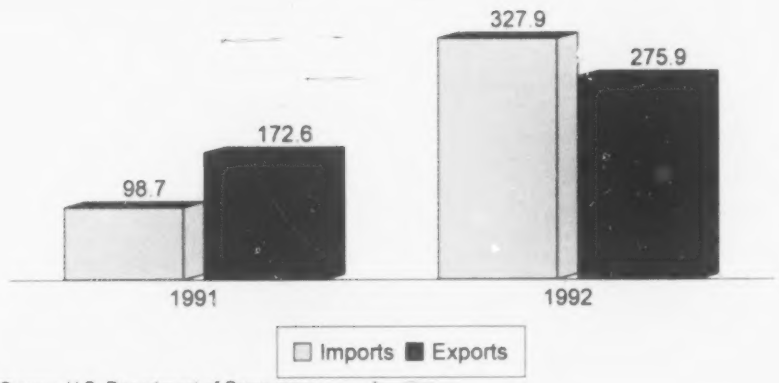
INDONESIA: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.0	0.0	0.4	0.3
Passive Components	2.9	3.8	16.2	15.5
Solid State Products	26.2	43.2	12.5	16.7
Consumer Electronics	22.2	172.2	2.5	2.1
Telecommunications	45.7	66.5	64.8	146.8
Other Communications	0.0	0.0	11.2	25.4
Computers & Peripherals	1.7	42.2	36.1	39.6
Industrial Electronics	0.0	0.0	23.4	25.7
Electromedical Electronics	0.0	0.0	3.5	3.8
TOTALS	98.7	327.9	172.6	275.9

SOURCE: U.S. Department of Commerce

U.S. Electronics Trade With Indonesia

Millions of U.S. Dollars



Source: U.S. Department of Commerce

ISRAEL

ISRAEL: ECONOMIC PROFILE
POPULATION: 5.19 million

	1990	1991	1992[e]
GDP (current U.S. $ billions)	51.2	57.9	66.6
GDP Per Capita (current U.S. $)	10,622.4	11,465.3	12,832.4
Real GDP Growth (%)	5.4	5.9	6.0
Consumer Price Index (% change)	17.6	18.0	9.0
Unemployment (%)	9.6	10.6	11.0
Avg. Exchange Rate (New Shequalim per U.S. $)	2.0	2.3	2.5

[e]-estimate
Source: U.S. Department of Commerce

ISRAEL: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.0	0.1	3.2	3.2
Passive Components	59.8	60.1	83.5	50.5
Solid State Products	145.1	154.3	82.7	98.7
Consumer Electronics	1.7	1.7	15.2	14.4
Telecommunications	161.8	254.1	88.2	117.1
Other Communications	27.6	43.3	73.6	97.7
Computers & Peripherals	120.3	144.9	204.5	214.8
Industrial Electronics	17.2	20.7	86.6	91.0
Electromedical Electronics	30.6	36.8	22.8	23.9
TOTALS	564.1	716.0	660.3	711.3

SOURCE: U.S. Department of Commerce

ISRAEL: ELECTRONIC INDUSTRY EXPORTS ($ millions)

	1991	1992
Civilian Exports		
Communication Equipment	252	376
Computers Communication	131	166
Electronics Components	373	485
Industrial Equipment	522	607
Medical Equipment	172	177
TOTAL Civilian	1,454	1,811
Defense Exports	833	814

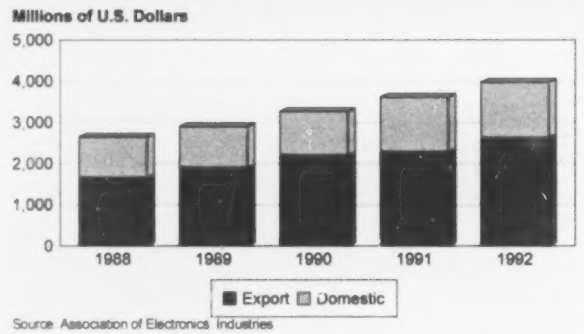
SOURCE: Association of Electronics Industries (Israel)

ISRAEL: ELECTRONICS INDUSTRY SALES
(U.S. $ millions)

Year	Export	Domestic	Total
1988	1,660	990	2,650
1989	1,900	1,000	2,900
1990	2,200	1,070	3,270
1991	2,283	1,335	3,618
1992 (Est.)	2,625	1,355	3,980

SOURCE: Association of Electronic Industries (Israel)

Israel Electronic Sales



Source: Association of Electronics Industries

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JAPAN

JAPAN: ECONOMIC PROFILE

POPULATION: 124.45 million

	1989	1990	1991	1992
GNP (current $ billions)	2,892	2,961	3,386	3,707
Real GNP Growth (%)	4.8	5.2	4.5	1.5
GNP Per Capita ($)	23,464	23,954	27,297	29,787
Inflation (CPI, %)	2.3	3.2	3.3	1.6
Unemployment Rate (%)	2.3	2.1	2.1	2.2
Avg. Exchange Rate (Yen per U.S. $)	137.96	144.79	134.71	126.57

SOURCE: U.S. Department of Commerce

JAPAN: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	368.6	433.0	65.1	59.0
Passive Components	2,258.3	2,197.0	519.0	272.8
Solid State Products	3,658.1	4,403.5	1,562.7	1,521.8
Consumer Electronics	7,682.0	7,499.9	211.4	249.5
Telecommunications	2,378.6	2,920.0	581.3	614.7
Other Communications	104.4	128.1	290.4	307.1
Computers & Peripherals	9,835.4	11,445.0	3,626.8	3,633.8
Industrial Electronics	717.1	834.5	969.4	971.3
Electromedical Electronics	607.8	707.3	455.6	456.5
TOTALS	27,610.3	30,568.3	8,281.7	8,086.5

SOURCE: U.S. Department of Commerce

JAPAN

JAPAN PRODUCTION TRENDS

CONSUMER ELECTRONICS ($ Millions)

	1990	1991
Television Receivers	6,237.6	7,021.9
Video Tape Recorders (excluding those for broadcasting use)	7,448.7	7,713.0
Video Disk Players	996.2	1,016.3
Video Cameras	5,085.0	6,837.8
Audio Recording/Reproducing Equip (excluding those for automobile use)	3,336.2	3,746.4
Stereos	3,796.5	5,216.2
Others	3,738.6	3,977.0
TOTAL	30,638.8	35,528.6

SOURCE: Ministry of International Trade & Industry; Ministry of Finance; Electronic Industries Association of Japan

ELECTRONIC COMPONENTS & DEVICES ($ Millions)

	1990	1991
Passive Components	8,661.5	9,979.6
Transducers	3,164.3	3,427.0
Connecting Components	9,286.2	10,709.5
Others	5,625.2	5,730.2
Electronic Tubes	4,807.8	5,334.8
Discrete Semiconductors	4,904.0	5,655.4
Integrated Circuits	20,121.2	23,073.0
Liquid Crystal Devices	1,260.6	1,893.2
TOTAL	57,830.8	65,802.7

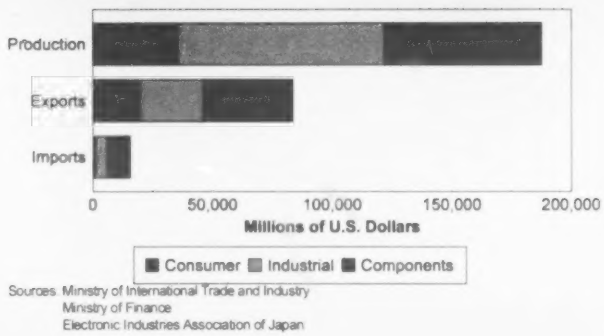
SOURCE: Ministry of International Trade and Industry; Ministry of Finance; Electronic Industries Association of Japan

INDUSTRIAL ELECTRONICS ($ Millions)

	1990	1991
Telecommunications Systems	13,700.8	14,490.8
Radio Communications Systems	6,864.0	8,225.3
Computers & Related Equipment	40,156.5	44,449.3
Electronic Application Equipment (excluding computers)	6,187.8	6,405.8
Electric Measuring Instruments	2,489.9	2,576.5
Industrial Measuring Instruments	2,145.4	2,482.7
Desktop Calculators	736.3	866.0
Japanese-Language Word Processors	1,811.0	2,056.7
Accounting Machines	710.1	752.8
Copiers	3,614.3	4,087.3
TOTAL	78,416.1	86,393.2

SOURCE: Ministry of International Trade and Industry; Ministry of Finance; Electronic Industries Association of Japan

Electronics in Japan, 1992



Sources: Ministry of International Trade and Industry
Ministry of Finance
Electronic Industries Association of Japan

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JAPAN

JAPAN EXPORT TRENDS

CONSUMER ELECTRONICS ($ Millions)

	1990	1991
Television Receivers	1,741.0	1,869.6
Video Recording/Reproducing Equip.	6,368.0	5,748.9
Home Video Camera w/Recorder	4,148.2	5,639.8
Tape Recorders (including stereo sets)	1,990.3	2,546.0
Stereo Components	2,160.6	2,503.3
Others	1,672.0	1,708.9
TOTAL	18,080.1	20,016.5

SOURCE: Ministry of International Trade and Industry; Ministry of Finance; Electronic Industries Association of Japan

ELECTRONIC COMPONENTS & DEVICES ($ Millions)

	1990	1991
Passive Components	2,253.1	2,538.2
Transducers	1,174.3	1,238.5
Connecting Components	1,931.6	2,173.9
Other Electronic Components	2,527.8	2,611.1
Electronic Tubes	2,273.8	2,622.5
Discrete Semiconductors	1,412.3	1,706.9
Integrated Circuits	7,606.2	8,254.8
Parts & Accessories	14,893.6	16,466.3
TOTAL	34,072.7	37,612.2

SOURCE: Ministry of International Trade and Industry; Ministry of Finance; Electronic Industries Association of Japan

INDUSTRIAL ELECTRONICS ($ Millions)

	1990	1991
Telecommunications Systems	3,310.6	3,347.2
Radio Communications Systems	2,398.5	2,881.8
Computers & Related Equipment	12,149.6	13,428.8
Others	1,523.2	1,680.6
Electric Measuring Instruments	584.4	699.1
Industrial Measuring Instruments	516.0	540.7
Desktop Calculators	353.7	321.0
Accounting Machines	2.0	9.7
Cash Registers	381.8	413.9
Word Processors	121.3	88.1
Copiers	2,436.3	2,626.5
TOTAL	23,777.4	26,037.4

SOURCE: Ministry of International Trade and Industry; Ministry of Finance; Electronic Industries Association of Japan

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JAPAN

JAPAN: IMPORT TRENDS

CONSUMER ELECTRONICS ($ Millions)

	1990	1991
Television Receivers	165.4	298.6
Video Recording/Reproducing Equip.	53.5	56.7
Audio Recording/Reproducing Equip.	313.7	405.1
Stereo Components	148.7	158.4
Others	99.8	88.5
TOTAL	781.1	1,007.3

SOURCE: Ministry of International Trade and Industry; Ministry of Finance; Electronic Industries Association of Japan.

ELECTRONIC COMPONENTS & DEVICES ($ Millions)

	1990	1991
Passive Components	472.3	547.8
Transducers	477.7	558.2
Connecting Components	438.4	491.6
Other Electronic Components	262.6	242.9
Electronic Tubes	252.4	297.1
Discrete Semiconductors	332.6	442.2
Integrated Circuits	2,592.9	3,022.8
Parts & Accessories	3,425.0	3,944.2
TOTAL	8,253.9	9,546.8

SOURCE: Ministry of International Trade and Industry; Ministry of Finance; Electronic Industries Association of Japan.

INDUSTRIAL ELECTRONICS ($ Millions)

	1990	1991
Telecommunications Systems	364.1	427.1
Radio Communications Systems	305.5	343.7
Computers & Related Equipment	2,936.3	3,071.4
Other Electronic Application Equipment	352.7	418.0
Electric Measuring Instruments	463.5	473.2
Industrial Measuring Instruments	210.9	201.8
Desktop Calculators	103.0	132.3
Accounting Machines	0.1	0.4
Cash Registers	0.4	0.8
Copiers	45.8	34.2
TOTAL	4,782.3	5,102.9

SOURCE: Ministry of International Trade and Industry; Ministry of Finance; Electronic Industries Association of Japan.

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KOREA

KOREA: ECONOMIC PROFILE
POPULATION: 43.5 million

	1990	1991	1992[e]
GDP ($ billions)	244.0	282.8	328.0
GDP Growth Rate (%)	12.0	15.9	16.0
GDP Per Capita ($)	5,692	6,536	7,561
Inflation (%)	10.6	10.9	12.0
Unemployment (%)	2.4	2.3	2.4
Avg. Exchange Rate (Won per U.S. $)	707.9	733.6	787.0

[e]-estimate
SOURCE: U.S. Department of Commerce

KOREA: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	7.4	8.4	26.8	44.2
Passive Components	198.0	200.9	163.3	92.1
Solid State Products	1,778.5	1,983.0	917.5	1,057.7
Consumer Electronics	1,476.0	1,607.3	52.5	39.6
Telecommunications	342.6	349.7	280.1	326.5
Other Communications	41.2	42.0	62.4	72.7
Computers & Peripherals	1,272.7	1,433.2	508.1	530.9
Industrial Electronics	20.6	23.2	441.6	461.4
Electromedical Electronics	7.5	8.5	71.9	75.1
TOTALS	5,144.5	5,656.2	2,524.2	2,700.2

SOURCE: U.S. Department of Commerce

KOREA: TOTAL ELECTRONIC MARKET

PRODUCTION			EXPORTS			IMPORTS		
1989	1990	1991	1989	1990	1991	1989	1990	1991
28,634	29,937	33,104	16,564	17,224	19,334	8,929	9,849	11,245

NOTE: Figures may not equal the TOTAL amount.
Please see next page for product detail.

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KOREA

KOREA: INDUSTRIAL ELECTRONICS ($ Millions)

	PRODUCTION			EXPORTS			IMPORTS		
	1989	1990	1991	1989	1990	1991	1989	1990	1991
Personal Computer	1,733	1,328	1,485	971	632	719	na	na	na
Computer	na	na	na	na	na	na	1,468	1,671	1,899
Peripherals	1,423	1,831	2,000	1,294	1,531	1,750	na	na	na
Wire Communication Equipment	539	452	443	332	265	211	228	238	193
Wireless Communication Equipment	na	na	na	na	na	na	190	381	522
CB Transceiver	79	78	62	79	76	48	na	na	na
Exchanger	787	661	696	na	na	na	na	na	na
Measuring Equipment	83	92	98	78	76	87	312	305	365
Desk Top Calculator	65	56	46	49	59	42	na	na	na
Other Industrial	1,387	2,071	2,274	682	842	1,038	468	472	551
Industrial TOTAL	6,096	6,569	7,104	3,485	3,481	3,895	2,573	3,067	3,530

KOREA: CONSUMER ELECTRONICS ($ Million)

	PRODUCTION			EXPORTS			IMPORTS		
	1989	1990	1991	1989	1990	1991	1989	1990	1991
TV (Total TVs-All Types)	na	na	na	na	na	na	18	23	16
TV C-TV (Color TV)	1,744	2,027	2,225	1,168	1,347	1,485	na	na	na
VCR (Consumer)	1,797	1,567	1,770	1,239	1,140	1,286	na	na	na
VTR (Consumer & Industrial)	na	na	na	na	na	na	31	29	32
Portable & Home Tape Equipment	1,008	1,070	991	1,271	1,341	1,203	35	35	35
Component Audio System	669	611	652	299	215	224	na	na	na
Car Stereo	694	789	707	584	617	538	na	na	na
Microwave Oven	1,015	687	893	815	534	639	na	na	na
Electronic Watch	332	196	290	44	12	32	na	na	na
Other Consumer	2,988	3,553	3,526	528	521	647	586	638	659
Consumer TOTAL	10,247	10,500	11,054	5,948	5,727	6,054	670	729	743

KOREA: ELECTRONIC COMPONENTS ($ Millions)

	PRODUCTION			EXPORTS			IMPORTS		
	1989	1990	1991	1989	1990	1991	1989	1990	1991
Color Picture Tubes	1,141	1,256	1,566	549	708	895	na	na	na
Electron Tube	na	na	na	na	na	na	443	467	617
Integrated Circuits	4,039	4,404	5,648	3,571	4,073	5,147	2,385	2,758	3,447
Connector	na	na	na	na	na	na	139	142	155
Resistor	295	274	270	45	45	43	108	107	117
Condenser	461	470	489	121	141	150	159	154	187
Magnetic Tape	1,093	1,116	1,097	801	871	910	49	57	68
Printed Circuit Boards	427	389	460	87	100	148	na	na	na
Printed Circuit Boards TV	na	na	na	na	na	na	89	83	99
TV Tuner	na	na	na	na	na	na	45	42	59
Micro Motor	na	na	na	na	na	na	141	124	103
Magnetic Head	467	669	639	369	414	306	na	na	na
Other Component	4,368	4,290	4,777	1,588	1,664	1,786	2,125	2,122	2,120
Components TOTAL	12,291	12,868	14,946	7,131	8,016	9,385	5,683	6,056	6,972

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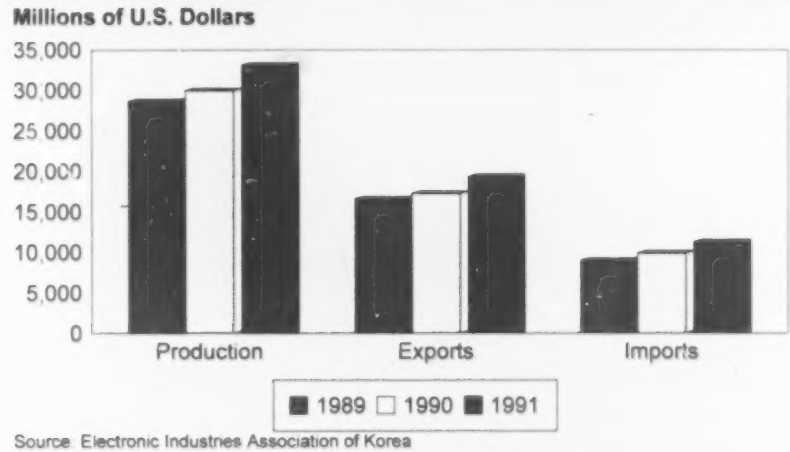
KOREA

SPECIAL REPORT: DEFENSE ELECTRONICS

The perception that reunification with North Korea is inevitable but not immediate, colors the way the South Koreans are looking at their defense requirements. The North Korean threat still drives the definition of defense requirements; but the selection of equipment and technology to meet these requirements increasingly includes the consideration of which alternatives provide the best regional security for a unified Korea.

The Korean procurement account, the Force Improvement Plan (FIP), is mostly committed to major ongoing programs such as the Korea Fighter Program. Approximately $840 million each year is available for new starts. The total procurement account is expected to remain flat at $3.7 billion per year or possibly experience a slight decrease in coming years.

Electronics Production and Trade in South Korea



Source: Electronic Industries Association of Korea

MALAYSIA

MALAYSIA: ECONOMIC PROFILE
POPULATION: 18.2 million

	1990	1991	1992
GNP (current $ billions)	40.6	44.8	50.1
Real GNP Growth Rate (%)	11.5	8.9	9.2
GNP Per Capita (Current U.S. $)	2,287	2,466	2,692
Inflation (%)	3.1	4.5	5.0
Unemployment (%)	6.0	5.6	5.4
Avg. Exchange Rate (Ringgit per U.S. $)	2.70	2.75	2.60

SOURCE: U.S. Department of Commerce

MALAYSIA: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.0	2.8	2.7	0.5
Passive Components	200.1	224.3	36.6	37.9
Solid State Products	1,629.6	2,020.5	1,628.4	1,720.6
Consumer Electronics	1,108.9	1,663.3	3.5	3.3
Telecommunications	501.0	637.8	63.6	98.6
Other Communications	8.3	10.6	3.7	5.8
Computers & Peripherals	366.8	901.6	177.4	236.1
Industrial Electronics	2.6	6.5	81.9	109.0
Electromedical Electronics	1.5	3.7	4.4	5.9
TOTALS	3,818.8	5,471.1	2,002.2	2,217.7

SOURCE: U.S. Department of Commerce

MALAYSIA: INDUSTRY IMPORTS, ALL COUNTRIES ($ millions*)

Year	Components	Consumer Electronics	Industrial Electronics
1987	2,727.0	102.4	265.9
1988	3,157.3	165.7	372.3
1989	3,660.0	340.7	778.1
1990	3,471.0	178.2	1,676.2
1991	5,447.3	168.7	2,768.7

*-Converted from real 1981 Ringgit.
SOURCE: Ministry of International Trade and Industry, Malaysia

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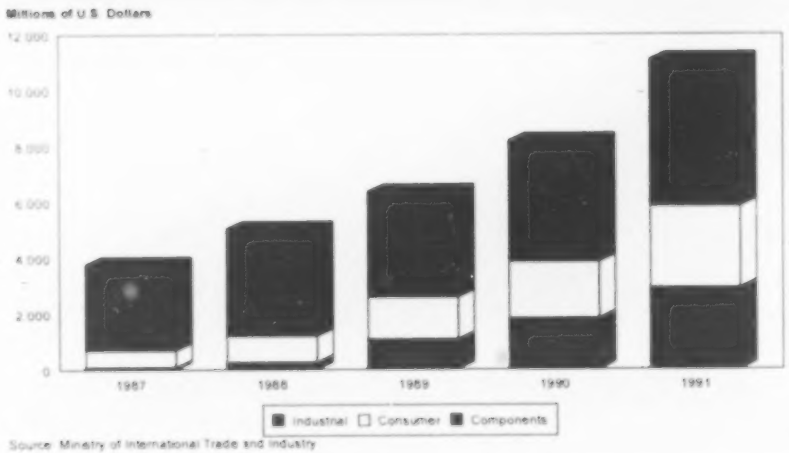
MALAYSIA

MALAYSIA: INDUSTRY EXPORTS, ALL COUNTRIES ($ millions*)

Year	Components	Consumer Electronics	Industrial Electronics
1987	3,076.3	618.4	70.2
1988	3,834.2	961.1	242.5
1989	3,772.5	1,516.5	1,072.4
1990	4,333.6	2,037.0	1,814.9
1991	5,252.2	2,937.2	2,898.3

*-Converted from real 1981 Ringgit.

Malaysian Electronic Exports



Source: Ministry of International Trade and Industry

PAKISTAN

PAKISTAN: ECONOMIC PROFILE
POPULATION: 115.5 million

	1989*	1990*	1991e*
GDP (current U.S. $ billions)	40.1	40.5	45.4
GNP Per Capita (current U.S. $)	370	379	389
GDP Growth (%)	4.9	5.3	6.5
Avg. Exchange Rate (Rupees per U.S. $)	19.2	21.3	22.4

*-PFY=Pakistan Fiscal Year (July 1 - June 30)
e-estimate
SOURCE: U.S. Department of Commerce

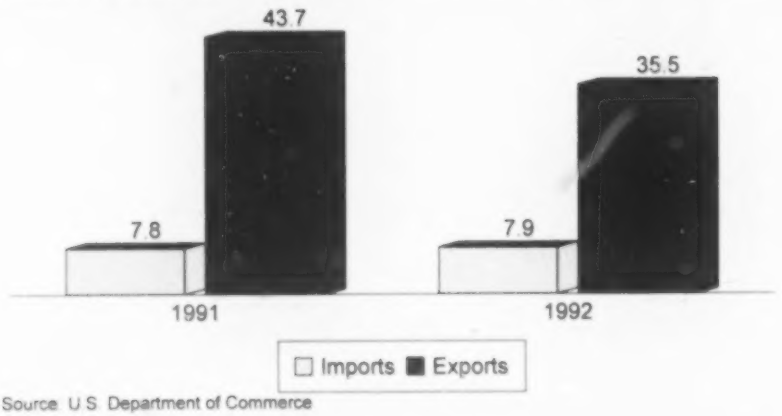
PAKISTAN: U.S. IMPORTS/EXPORTS (U.S. $ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.0	0.0	0.1	0.5
Passive Components	0.2	0.1	2.1	3.5
Solid State Products	0.0	0.0	0.6	0.2
Consumer Electronics	0.0	0.1	0.8	0.5
Telecommunications	0.0	0.0	12.0	5.7
Other Communications	0.0	0.0	6.7	3.2
Computers & Peripherals	0.0	0.0	9.9	10.1
Industrial Electronics	0.0	0.0	8.3	8.5
Electromedical Electronics	7.6	7.7	3.2	3.3
TOTALS	7.8	7.9	43.7	35.5

SOURCE: U.S. Department of Commerce

U.S. Electronics Trade With Pakistan

Millions of U.S. Dollars



Source: U.S. Department of Commerce

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PHILIPPINES

PHILIPPINES: ECONOMIC PROFILE
POPULATION: 64 million

	1990	1991	1992[e]
GDP ($ billions)	46.7	45.1	51.9
GDP Growth Rate (%)	2.4	(1.0)	2.1
GDP Per Capita (U.S. $)	764	717	807
Inflation (%)	13.3	18.7	9.7
Unemployment (%)	10.0	10.5	10.5
Avg. Exchange Rate (Pesos per U.S. $)	24.0	27.5	26.8

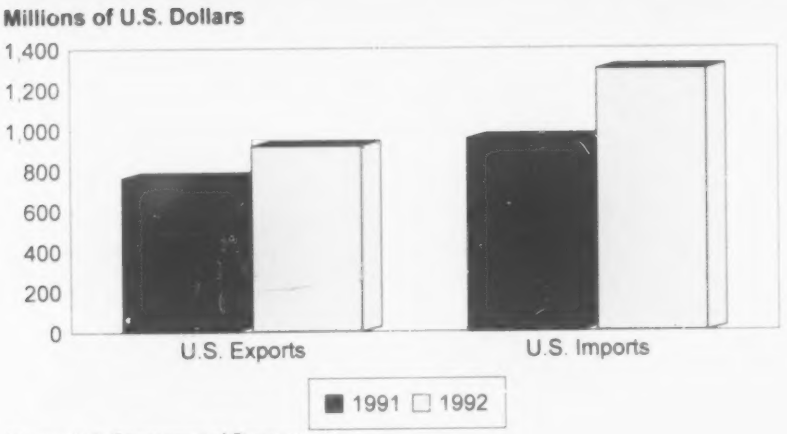
[e]-estimate
SOURCE: U.S. Department of Commerce

PHILIPPINES: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.0	0.0	0.6	0.3
Passive Components	27.7	30.4	28.4	26.8
Solid State Products	650.2	826.4	580.8	684.0
Consumer Electronics	45.4	50.8	5.1	6.7
Telecommunications	164.2	248.2	46.7	83.9
Other Communications	1.3	1.9	3.1	5.6
Computers & Peripherals	63.0	135.1	55.7	63.8
Industrial Electronics	0.9	2.0	38.1	43.7
Electromedical Electronics	0.0	0.0	3.4	3.9
TOTALS	952.7	1,294.8	761.9	918.7

SOURCE: U.S. Department of Commerce

Philippines-U.S. Electronics Trade



Source: U.S. Department of Commerce

SINGAPORE

SINGAPORE: ECONOMIC PROFILE
POPULATION: 2.76 million

	1990	1991	1992[e]
GDP (current U.S. $ billions)	35.1	39.9	45.8
Real GDP Growth (%)	8.3	6.7	4.5-5
GNP Per Capita (U.S. $)	11,790	13,070	14,950
Inflation (%)	3.4	3.4	2.5
Unemployment (%)	1.7	1.9	2.0
Avg. Exchange Rate (Singapore $ per U.S. $)	1.81	1.73	1.62

[e]-estimate
SOURCE: U.S. Department of Commerce

SINGAPORE: U.S. IMPORTS/EXPORTS (U.S. $ millions)

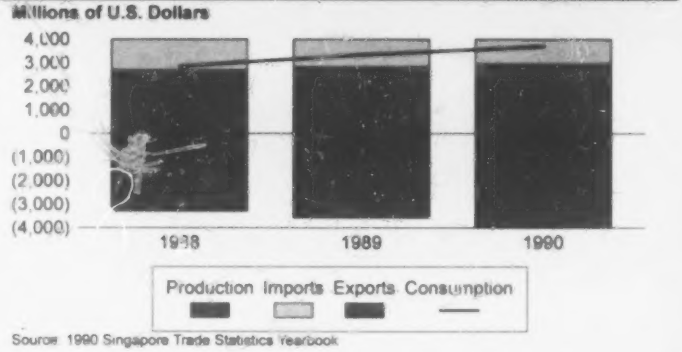
	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.2	0.2	19.4	11.7
Passive Components	459.4	447.5	208.8	217.7
Solid State Products	1,176.8	1,253.5	1,294.1	1,616.2
Consumer Electronics	655.8	671.0	45.0	50.6
Telecommunications	283.5	265.9	113.1	168.4
Other Communications	20.7	19.4	23.8	35.4
Computers & Peripherals	4,363.0	5,468.5	1,314.1	1,484.8
Industrial Electronics	12.6	15.8	201.3	227.4
Electromedical Electronics	23.7	29.7	25.5	28.8
TOTALS	6,995.7	8,171.5	3,245.1	3,841.0

SOURCE: U.S. Department of Commerce

SPECIAL REPORT:
DEFENSE ELECTRONICS IN SOUTHEAST ASIAN NATIONS

The EIA study shows a smaller defense market in Singapore, Thailand, Indonesia, and Malaysia with defense procurement accounts that range in size from $450 million to $800 million per year compared with $2 billion to $10 billion in Australia, Korea, Taiwan, and Japan. Air traffic control, harbor surveillance and C3 upgrades are listed by the study as among the best new opportunities for U.S. defense electronics in all four Southeast Asian countries.

Singapore's *Active Electronic Components* Industry



Source: 1990 Singapore Trade Statistics Yearbook

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SINGAPORE

SINGAPORE:
1990 ELECTRONIC COMPONENTS (U.S. $ millions)

	Total Imports	Total Exports
Integrated Circuits	3,145	2,910
Capacitors	460	247
Television Tubes	337	336
Resistors	207	88
Printed Circuit Boards	340	224
Transistors	245	92
Other Semiconductors	140	88

SOURCE: 1990 Singapore Trade Statistics Yearbook

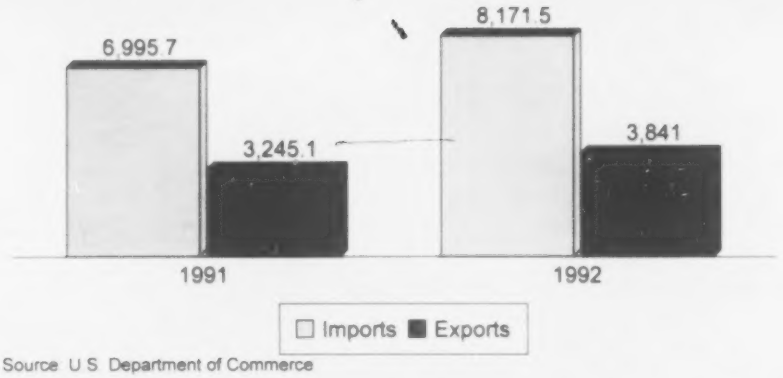
SINGAPORE: ACTIVE ELECTRONIC COMPONENTS (U.S. $ millions)

	1988	1989	1990
Imports	3,484	4,107	4,735
Production	2,673	2,813	2,951
Exports	3,302	3,583	3,986

SOURCE: 1990 Singapore Trade Statistics Yearbook

U.S Electronics Trade With Singapore

Millions of U.S. Dollars



Source U.S. Department of Commerce

TAIWAN

TAIWAN: ECONOMIC PROFILE
POPULATION: 20 million

	1990	1991	1992[e]
GNP (current U.S. $ billions)	162.1	175.9	208.1
Per Capita GNP (U.S. $)	7,992	8,609	10,087
Real GNP Growth (%)	5.2	6.1	7.3
Inflation (%)	4.1	3.8	4.2
Unemployment (%)	1.7	1.5	1.6
Avg. Exchange Rate (NTS per U.S. $)	26.9	26.8	25.0

[e]-estimate
SOURCE: U.S. Department of Commerce

TAIWAN: U.S. IMPORTS/EXPORTS (U.S. $ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	49.0	44.7	18.4	27.0
Passive Components	986.2	1,092.2	166.9	136.8
Solid State Products	672.9	931.1	1,156.4	1,470.7
Consumer Electronics	615.6	681.7	114.3	139.4
Telecommunications	428.5	582.3	244.5	357.9
Other Communications	84.7	115.1	87.5	128.0
Computers & Peripherals	3,475.3	4,369.4	452.5	610.8
Industrial Electronics	50.3	63.2	240.9	325.1
Electromedical Electronics	10.3	13.0	42.9	57.9
TOTALS	6,372.8	7,892.7	2,524.3	3,253.6

SOURCE: U.S. Department of Commerce

TAIWAN: 1991 ELECTRONIC PRODUCTS (U.S. $ millions)

	EXPORTS	IMPORTS
ELECTRONIC EQUIPMENT	8,434.1	2,773.6
Consumer Electronic Equipment	1,864.7	770.6
Communication Electronic Equipment	795.7	312.6
Information Processing Equipment	5,550.2	1,168.8
Measuring & Controling Equipment	116.9	444.5
Other Equipment	106.6	77.1

SOURCE: *1991 Imports and Exports of Electronic Products*, Republic of China

SPECIAL REPORT: DEFENSE ELECTRONICS

The EIA study found that Taiwan has developed a new defense strategy as a result of observations of the Gulf War. The new strategy stresses high tech defense against air attack and naval blockade, now considered the most probable threats, and reduces the traditional emphasis on ground forces. Upgrades of existing equipment, electronics components of indigenous programs, and electronics intelligence, surveillance, and training and simulation programs that support the new strategy appear to be the best new opportunities for U.S. defense electronics.

Taiwan has developed a new defense strategy as a result of observations of the Gulf War.

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TAIWAN

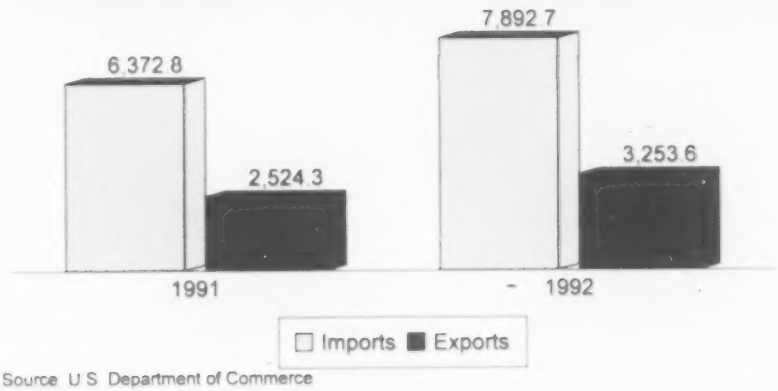
TAIWAN: 1991 ELECTRONIC PRODUCTS (U.S. $ millions)

	EXPORTS	IMPORTS
ELECTRONIC COMPONENTS	10,320.4	7,526.0
Consumer Parts & Accessories	3,613.3	570.3
Passive Components	1,236.2	620.4
Semiconductors & Integrated Circuits	1,925.0	4,225.9
Displays & Tubes	944.3	1,121.7
Electronic Computer Parts	1,303.5	574.7
Communication Equipment Parts	257.6	212.1
Electronic Wires & Cables	393.1	124.0
Other Electronic Parts	647.4	76.9
TOTALS	18,754.5	10,299.6

SOURCE: 1991 Imports and Exports of Electronic Products, Republic of China

U.S. Electronics Trade With Taiwan

Millions of U.S. Dollars



Source U S Department of Commerce

THAILAND

THAILAND: ECONOMIC PROFILE
POPULATION: 57.6 million

	1990	1991	1992[e]
GDP (current U.S. $ billions)	80.2	93.3	103.0
Real GDP Growth (%)	10.0	7.9	7.5
Per Capita GDP (U.S. $)	1,408	1,630	1,750
Unemployment Rate (%)	3.8	4.2	4.6

[e]-estimate
SOURCE: U.S. Department of Commerce

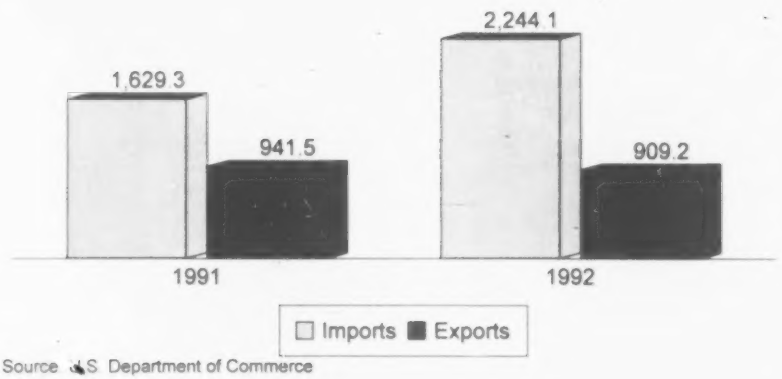
THAILAND: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.0	0.0	8.8	2.0
Passive Components	90.8	130.3	45.9	39.4
Solid State Products	382.5	314.9	492.2	402.0
Consumer Electronics	381.5	569.5	8.7	8.6
Telecommunications	229.7	296.6	84.9	133.6
Other Communications	0.2	0.2	4.0	6.3
Computers & Peripherals	536.0	918.0	234.8	250.9
Industrial Electronics	1.2	2.0	44.4	47.4
Electromedical Electronics	7.4	12.6	17.8	19.0
TOTALS	1,629.3	2,244.1	941.5	909.2

SOURCE: U.S. Department of Commerce

U.S. Electronics Trade With Thailand

Millions of U.S. Dollars



Source: U.S. Department of Commerce

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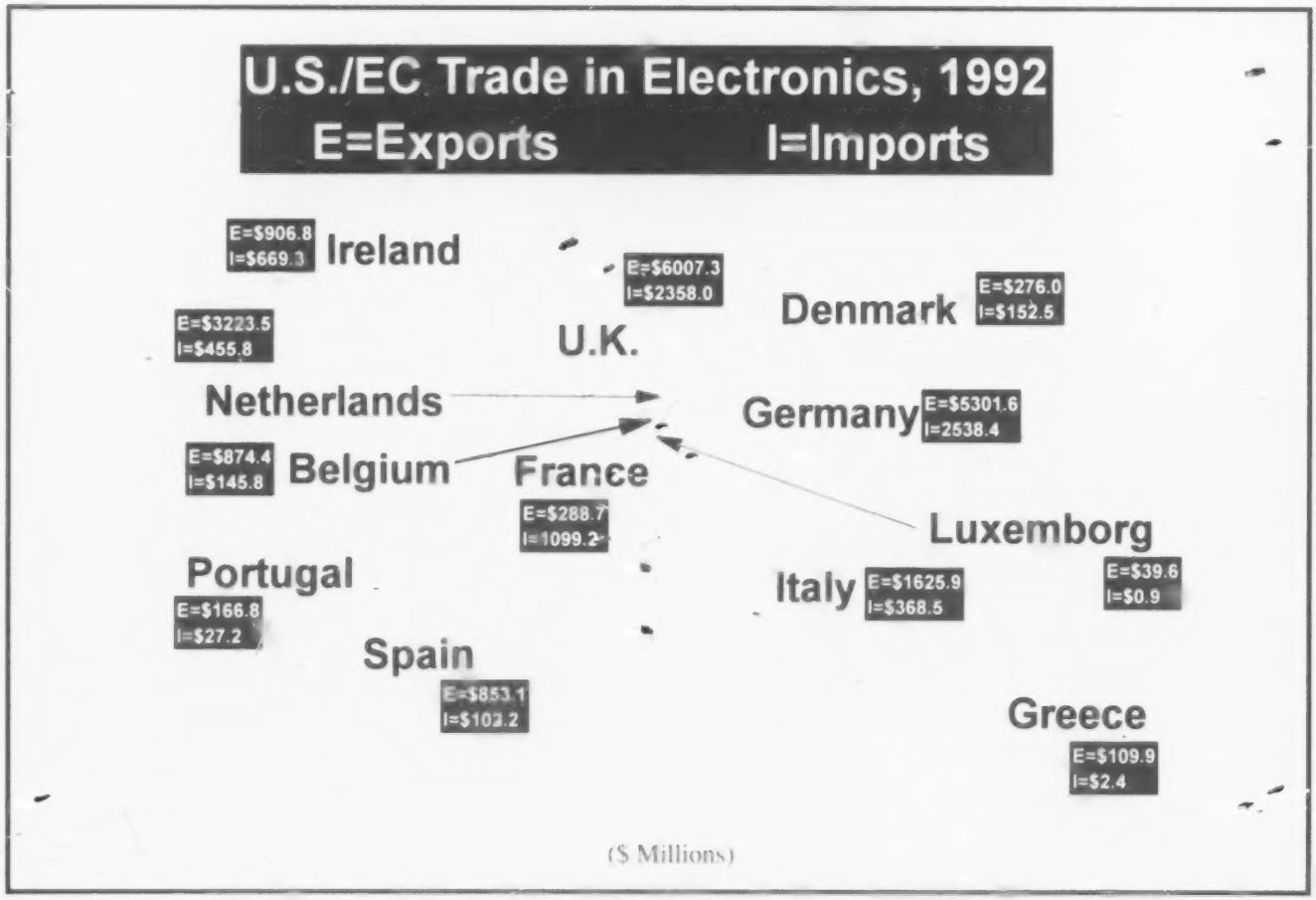
EUROPE

EUROPEAN COMMUNITY

As the long-awaited process of European integration slowly moves forward, trade with the U.S. remains vital. U.S. exports of electronics to Europe of $22.2 billion, represent over 28% of total U.S. electronics exports. The U.K. is the largest market with $8.08 billion in exports; Germany is the second largest market with $5.3 billion in U.S. exports. The U.S. maintains a surplus with each European country and with all of the E.C., totalling more than $14.3 billion.

Much of the policy focus on Europe has been on the General Agreement on Tariffs and Trade (GATT) negotiations and attempts to remove barriers to European procurement practices. The GATT negotiations are expected to continue throughout 1993.



AUSTRIA

AUSTRIA: ECONOMIC PROFILE
POPULATION: 7.8 million

	1990	1991	1992
GDP ($ billion)	157.4	164.1	na
Real GDP Growth Rate (%)	4.9	3.0	1.8*
GDP Per Capita ($)	20,393	20,970	na
Inflation (%)	3.3	3.3	4.1
Unemployment (%)	5.4	5.8	5.9
Avg. Exchange Rate (Schillings per U.S. $)	11.37	11.68	10.95

* Projected
SOURCE: U.S. Department of Commerce

AUSTRIA: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.1	0.0	4.8	4.3
Passive Components	10.9	16.5	28.4	12.5
Solid State Products	10.0	6.2	22.4	17.9
Consumer Electronics	11.2	11.1	6.1	8.2
Telecommunications	1.0	0.3	16.7	26.1
Other Communications	0.0	0.0	3.9	6.0
Computers & Peripherals	24.4	41.8	144.2	138.5
Industrial Electronics	11.3	19.4	41.0	39.4
Electromedical Electronics	4.9	8.4	33.7	32.4
TOTALS	73.8	103.7	301.2	285.3

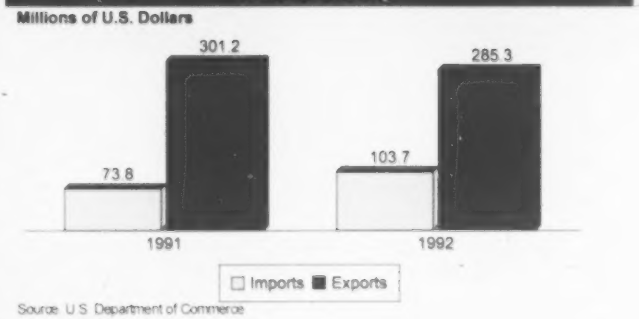
SOURCE: U.S. Department of Commerce

AUSTRIA: ACTIVE ELECTRONIC COMPONENTS ($ Millions)

	1990	1991	Estimated 1992
Imports	712.0	626.6	664.7
Production	512.0	572.8	616.4
Exports	574.1	497.3	535.1

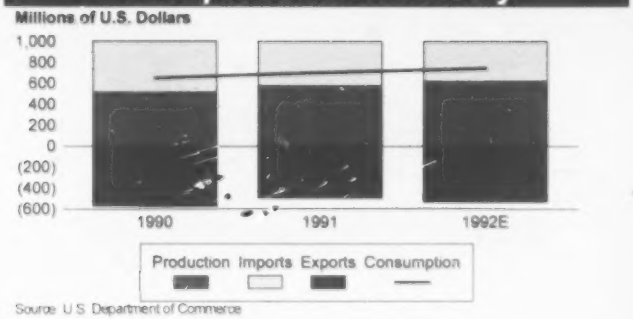
SOURCE: U.S. Department of Commerce

U.S Electronics Trade With Austria



Source: U.S. Department of Commerce

Austria's *Active Electronic Components* Industry



Source: U.S. Department of Commerce

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DENMARK

DENMARK: ECONOMIC PROFILE
POPULATION: 5.15 million

	1990	1991	1992[e]
GDP (current $ billions)	125.0	130.1	134.0
Real GDP growth rate (%)	1.7	1.9	1.0
GDP per capita ($)	25,333	25,490	25,980
Inflation (% change in CPI)	2.6	2.4	2.1
Unemployment (%)	9.7	10.6	11.4
Avg. Annual Exchange Rate (Kroner per U.S. $)	6.19	6.40	6.05

[e]-estimate
SOURCE: U.S. Department of Commerce

DENMARK: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S Exports	
	1991	1992	1991	1992
Electron Tubes	0.1	0.1	1.0	1.2
Passive Components	29.6	27.6	19.9	10.0
Solid State Products	2.1	2.4	14.5	14.6
Consumer Electronics	15.3	19.4	26.6	25.1
Telecommunications	13.3	19.7	38.6	45.3
Other Communications	6.4	9.5	8.3	9.7
Computers & Peripherals	15.6	18.3	122.2	129.9
Industrial Electronics	26.5	31.1	25.6	27.2
Electromedical Electronics	20.8	24.4	12.2	13.0
TOTALS	129.7	152.5	268.9	276.0

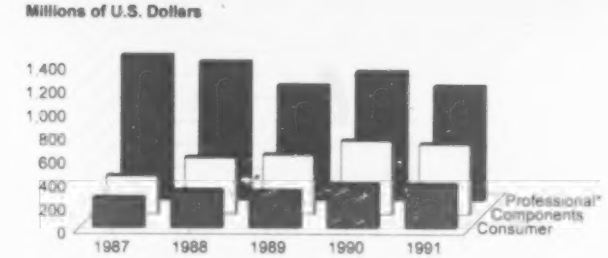
SOURCE: U.S. Department of Commerce

DENMARK: PRODUCTION (U.S. $ millions)

Year	Components	Consumer Electronics	Professional Electronics*	TOTAL
1987	322.5	257.6	1,229.5	1,809.6
1988	480.1	321.7	1,175.0	1,976.8
1989	505.5	316.4	975.5	1,797.4
1990	626.3	376.5	1,091.5	2,094.3
1991	595.9	374.4	969.5	1,939.8

* Includes telecommunications, data processing, industrial, medical, and aerospace electronics.
SOURCE: Danish Electronics Industry Association

Electronics Production In Denmark



Source: Danish Electronics Industry Association
*Telecommunications, data processing, industrial, medical and aerospace electronics.

FINLAND

FINLAND: ECONOMIC PROFILE
POPULATION: 5 million

	1990	1991	1992
GDP (current $ billions)	137.7	124.6	109.6
Real GDP Growth Rate (%)	0.4	(6.4)	(3.5)
GDP Per Capita ($)	27,540	24,790	21,681
Inflation (% change in CPI)	6.1	4.1	2.6
Unemployment (%)	3.4	7.6	13.1
Avg. Annual Exchange Rate (Markkaa per U.S. $)	3.82	4.04	4.48

SOURCE: U.S. Department of Commerce

FINLAND: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.1	0.0	1.3	1.8
Passive Components	10.1	8.9	7.2	9.0
Solid State Products	1.4	0.9	14.9	20.2
Consumer Electronics	0.3	0.2	3.1	2.4
Telecommunications	5.6	9.0	14.8	15.9
Other Communications	0.8	1.3	11.3	12.1
Computers & Peripherals	27.0	31.5	93.2	82.0
Industrial Electronics	13.9	16.2	26.1	23.0
Electromedical Electronics	18.5	21.6	10.3	9.1
TOTALS	77.7	89.6	182.3	175.5

SOURCE: U.S. Department of Commerce

FINLAND: PRODUCTION* (U.S. $ millions)

	1989	1990	1991
Consumer Electronics	231.7	232.1	180.9
Telecommunications	740.6	980.7	705.1
Measurement & Control, Process Automation	317.7	356.3	343.4
Computers and Office Equipment	438.5	504.9	327.1
Components	155.5	163.5	153.6

SOURCE: Federation of Finnish Electrical and Electronics Industries.

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FINLAND

FINLAND: EXPORTS (U.S. $ millions)

	1989	1990	1991
Consumer Electronics	178.5	215.1	161.6
Office equipment, ADP	255.6	328.4	334.8
Telecommunications	571.9	718.4	455.9
Medical equipment	147.3	174.8	182.1
Automation and measuring equipment	98.6	121.9	148.9
Components	184.9	288.9	234.6

SOURCE: Federation of Finnish Electrical and Electronics Industries.

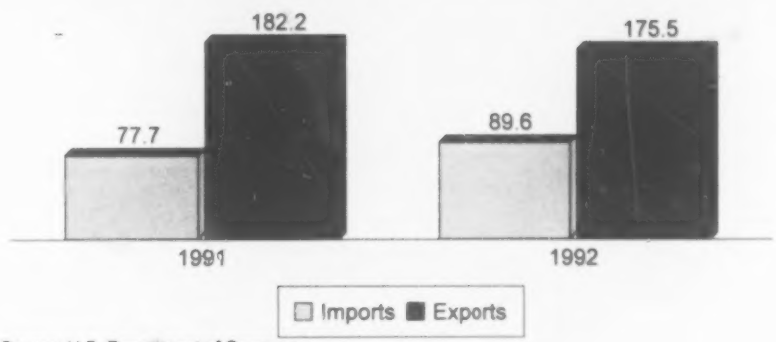
FINLAND: IMPORTS (U.S. $ millions)

	1989	1990	1991
Consumer Electronics	230.0	235.2	207.3
Office Equipment, ADP	985.6	982.7	772.9
Telecommunications	418.9	437.1	382.7
Medical Equipment	120.7	136.2	125.4
Automation and Measuring Equipment	156.6	170.3	152.7
Components	434.1	505.9	443.7

* Production figures for member firms.
SOURCE: Federation of Finnish Electrical and Electronics Industries

U.S Electronics Trade With Finland

Millions of U.S. Dollars



Source: U.S. Department of Commerce

FRANCE

FRANCE: ECONOMIC PROFILE
POPULATION: 57.2 million

	1990	1991	1992[e]
GDP (current $ billion)	1,189	1,197	1,225
Real GDP Growth Rate (%)	2.2	1.2	2.1
GDP Per Capita ($)	21,054	21,035	20,885
Inflation (%, CPI)	3.4	3.1	2.0
Unemployment (%)	8.9	9.8	10.5
Avg. Exchange Rate (francs per U.S. $)	5.4	5.6	5.3

[e]-estimate
SOURCE: U.S. Department of Commerce

FRANCE: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	25.7	34.6	26.2	20.3
Passive Components	93.2	80.6	242.9	137.2
Solid State Products	117.3	138.7	385.9	304.0
Consumer Electronics	8.7	15.3	47.9	57.9
Telecommunications	111.7	159.2	172.2	189.8
Other Communications	83.0	118.4	168.9	186.2
Computers & Peripherals	260.6	290.9	1,330.6	1,407.8
Industrial Electronics	108.9	121.6	371.9	393.5
Electromedical Electronics	125.3	139.9	181.5	192.0
TOTALS	934.4	1099.2	2,928.0	2,888.7

SOURCE: French Electrical and Electronic Industries Association

FRANCE: SALES BY DOMESTIC INDUSTRY (Including Exports) ($ Millions)

	1989	1990	1991
Consumer Electronics	1,758	2,736	2,800
Professional Equipment*	6,787	7,823	7,497
Telecommunications	3,741	4,479	4,520
Computer	12,409	14,638	13,747
Instrumentation	1,245	1,600	1,503
Radiology & Medical	471	609	554
Electron Tubes	605	778	775
Semiconductors	1,276	1,552	1,236
Passive Components	1,857	2,158	1,879
TOTALS	30,149	36,373	34,511

Note: Professional equipment includes detection systems, telecommunications, broadcasting and television, and navigation aids.
SOURCE: French Electrical and Electronic Industries Association

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FRANCE

FRANCE: EXPORTS ($ millions)

	1989	1990	1991
Consumer Electronics	1,241	1,827	2,052
Professional Equipment*	3,260	3,434	3,031
Telecommunications	770	1,019	1,141
Computer	4,482	4,988	5,322
Instrumentation	813	1,036	1,068
Radiology & Medical	363	506	629
Electron Tubes	378	440	455
Semiconductors	1,533	1,930	1,875
Passive Components	1,074	1,310	1,223
TOTALS	13,914	16,490	16,796

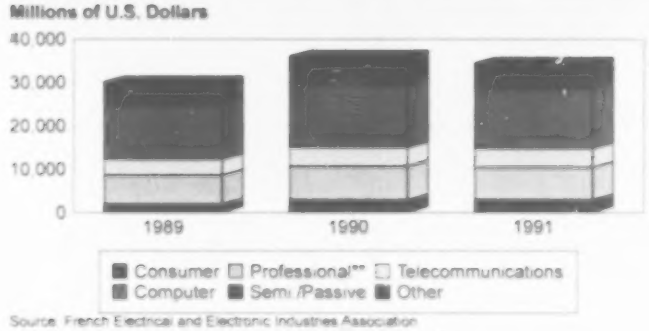
Note: Professional equipment includes detection systems, telecommunications, broadcasting and television, and navigation aids.
SOURCE: French Electrical and Electronic Industries Association

FRANCE: IMPORTS ($ millions)

	1989	1990	1991
Consumer Electronics	3,089	3,823	4,148
Professional Equipment*	690	771	798
Telecommunications	345	396	466
Computer	6,889	8,074	7,839
Instrumentation	1,112	1,295	1,305
Radiology & Medical	558	693	717
Electron Tubes	366	377	382
Semiconductors	1,885	2,361	2,144
Passive Components	1,514	1,975	2,172
TOTALS	16,448	19,765	19,971

*Note: Professional equipment includes detection systems, telecommunications, broadcasting and television, and navigation aids.
SOURCE: French Electrical and Electronic Industries Association

French Sales* Of Electronics



Source: French Electrical and Electronic Industries Association
*Includes Exports
**Includes detection systems, telecommunications, tv/broadcasting

GERMANY

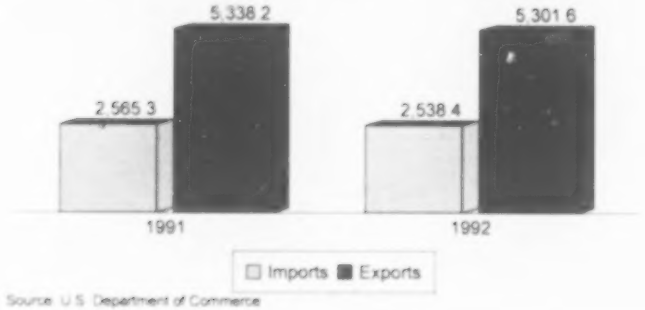
GERMANY: ECONOMIC PROFILE
POPULATION: 79.8 million

	1990	1991	1992
GNP (current $ billions)	1507.8	1588.0	1775.4
Real GNP Growth Rate (%)	5.0	3.6	1.9
GNP Per Capita ($)	18,895	19,900	n/a
Unemployment (%)	6.5	5.7	5.9
Avg. Annual Exchange Rate (Deutsche Mark per U.S. $)	1.62	1.66	1.56

SOURCE: U.S. Department of Commerce

U.S. Electronics Trade With Germany

Millions of U.S. Dollars



Source: U.S. Department of Commerce

GERMANY: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	31.2	37.7	30.3	20.0
Passive Components	435.0	292.5	378.8	233.8
Solid State Products	304.9	322.7	506.9	482.4
Consumer Electronics	87.3	81.0	143.3	131.1
Telecommunications	110.6	139.0	276.0	408.4
Other Communications	45.1	56.6	69.0	102.1
Computers & Peripherals	538.2	558.2	2,843.2	2,835.9
Industrial Electronics	360.9	374.3	594.9	593.4
Electromedical Electronics	652.1	676.4	495.8	494.5
TOTALS	2,565.3	2,538.4	5,338.2	5,301.6

SOURCE: U.S. Department of Commerce

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HUNGARY

HUNGARY: ECONOMIC PROFILE

POPULATION: 10.3 million

	1990	1991	1992[e]
GDP (current U.S. $ billions)	27.72	30.64	31.25
Real GDP Growth (%)	(4.30)	(10.00)	(8.00)
GDP Per Capita (US$)	2,678	2,974	3,022
Inflation (%)	29.00	39.90	25.00
Unemployment (%)	1.60	8.50	10.00
Exchange Rate (Forints per U.S. $)	63.20	74.81	79.50

[e]-estimate
SOURCE: U.S. Department of Commerce

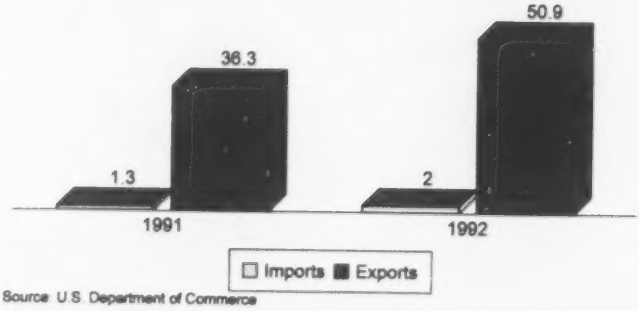
HUNGARY: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.1	0.1	0.0	0.1
Passive Components	0.3	0.5	2.5	2.3
Solid State Products	0.0	0.3	0.7	0.4
Consumer Electronics	0.0	0.0	0.9	0.7
Telecommunications	0.0	0.0	6.9	14.1
Other Communications	0.0	0.0	0.3	0.7
Computers & Peripherals	0.1	0.1	18.6	24.2
Industrial Electronics	0.5	0.6	2.9	3.8
Electromedical Electronics	0.3	0.4	3.5	4.6
TOTALS	1.3	2.0	36.3	50.9

SOURCE: U.S. Department of Commerce

U.S. Electronics Trade With Hungary

Millions of U.S. Dollars



Source: U.S. Department of Commerce

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ITALY

ITALY: ECONOMIC PROFILE

Population: 185 million

	1991	1992[e]
GDP (current $ billions)	1,050	1,237
Per Capita GDP (current U.S. $)	19,900	21,410
Inflation (%)	6.4	5.4
Unemployment Rate (%)	10.9	11.0
Avg. Exchange Rate (Lire per U.S. $)	1,241	1,233

[e]-estimate
SOURCE: U.S. Department of Commerce

ITALY: U.S. IMPORTS/EXPORTS ($ Millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.7	0.8	9.3	8.5
Passive Components	51.8	50.3	133.8	94.6
Solid State Products	36.5	46.5	259.7	239.4
Consumer Electronics	3.8	3.7	42.1	48.5
Telecommunications	26.9	18.6	219.7	206.7
Other Communications	24.1	16.6	65.2	61.3
Computers & Peripherals	117.3	168.2	595.3	592.8
Industrial Electronics	22.4	32.1	248.6	247.6
Electromedical Electronics	22.1	31.7	127.0	126.5
TOTALS	305.6	368.5	1,700.7	1,625.9

SOURCE: U.S. Department of Commerce

ITALY: PRODUCTION ($ Millions)

	1989	1990	1991
Telecommunications	4,370.5	5,670.5	5,764.0
Computers & information Technology	4,469.4	5,088.2	5,205.2
Defense, Systems, Space	2,804.0	3,405.1	3,514.1
Radio, Television, Stereo	1,027.6	1,282.0	1,191.4
Electromedical Equipment	150.1	182.8	199.9
Security	690.2	872.2	922.9
Electronic Components	1,971.4	2,255.2	2,047.4

SOURCE: Associazione Nazionale Industrie Elettrotechiche Ed Elettroniche.

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ITALY

ITALY: EXPORTS (U.S. $ Millions)

	1989	1990	1991
Telecommunications	405.9	518.8	558.3
Computers & Information Technology	3,858.1	4,178.1	4,051.4
Defense, Systems, Space	461.3	618.3	564.1
Radio, Television, Stereo	444.6	540.9	503.0
Electromedical Equipment	62.7	74.3	91.1
Security	112.2	166.9	164.4
Electronic Components	1,304.6	1,473.2	1,426.7

SOURCE: Associazione Nazionale Industrie Elettrotecniche Ed Elettroniche.

ITALY: IMPORTS (U.S. $ Millions)

	1989	1990	1991
Telecommunications	747.0	1,062.1	1,217.3
Computers & Information Technology	4,352.7	5,083.1	5,284.4
Defense, Systems, Space	371.7	503.8	434.1
Radio, Television, Stereo	1,822.0	2,297.8	2,095.8
Electromedical Equipment	391.4	495.0	513.5
Security	51.0	112.7	104.8
Electronic Components	2,111.4	2,385.4	2,180.4

SOURCE: Associazione Nazionale Industrie Elettrotecniche Ed Elettroniche

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NETHERLANDS

THE NETHERLANDS: ECONOMIC PROFILE
POPULATION: 14.9 million

	1990	1991	1992[e]
GDP (current U.S. $ billions)	290.0	294.8	297.2
Real GDP Growth Rate (%)	3.1	2.2	1.2
GDP Per Capita (U.S. $)	15,190	19,653	19,845
Inflation (% change in CPI)	2.5	3.7	3.5
Unemployment (%)	6.0	5.2	5.2
Avg. Exchange Rate (Guilder per U.S. $)	1.85	1.81	1.76

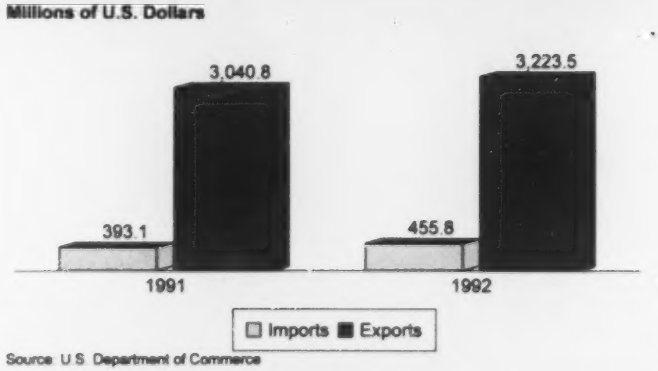
[e]-estimate
SOURCE: U.S. Department of Commerce

THE NETHERLANDS: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	6.3	4.9	16.6	17.3
Passive Components	26.4	29.5	141.6	161.7
Solid State Products	29.1	38.3	163.2	122.9
Consumer Electronics	10.0	10.0	74.4	97.6
Telecommunications	29.3	25.9	147.5	184.2
Other Communications	8.9	7.9	123.9	154.7
Computers & Peripherals	70.3	84.2	1,935.1	2,026.0
Industrial Electronics	66.2	79.4	179.5	187.9
Electromedical Electronics	146.6	175.7	259.0	271.2
TOTALS	393.1	455.8	3,040.8	3,223.5

SOURCE: U.S. Department of Commerce

U.S. Electronics Trade With The Netherlands



Source: U.S. Department of Commerce

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POLAND

POLAND: ECONOMIC PROFILE

POPULATION: 38.4 million

	1990	1991	1992*
GDP (current U.S. $ billions)	167.1	160.0	na
GDP Growth Rate (%)	(11.6)	(7.0)	na
GDP Per Capita (U.S. $)	1,675	1,799	1,850
Inflation Rate (%)	249.0	60.0	45.0
Unemployment (%)	5.0	11.4	18.0
Avg. Exchange Rate (Zlotys per U.S. $)	9,500	10,576	13,626

* Preliminary data.
SOURCE: U.S. Department of Commerce

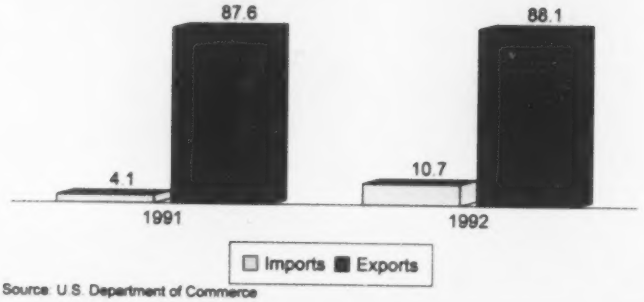
POLAND: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.0	0.0	1.2	0.1
Passive Components	2.9	8.6	4.6	5.1
Solid State Products	0.4	0.5	1.5	1.7
Consumer Electronics	0.0	0.2	3.5	1.6
Telecommunications	0.0	0.0	28.5	21.1
Other Communications	0.0	0.1	2.3	1.7
Computers & Peripherals	0.1	0.2	37.0	45.7
Industrial Electronics	0.6	0.9	4.5	5.5
Electromedical Electronics	0.1	0.2	4.5	5.6
TOTALS	4.1	10.7	87.6	88.1

SOURCE: U.S. Department of Commerce

U.S. Electronics Trade With Poland

Millions of U.S. Dollars



Source: U.S. Department of Commerce

RUSSIA

RUSSIA: ECONOMIC PROFILE	
POPULATION: 149.5 million	
Real GDP Growth 1991 (%)	(9.0)
Inflation Rate 1991 (%)	89.0

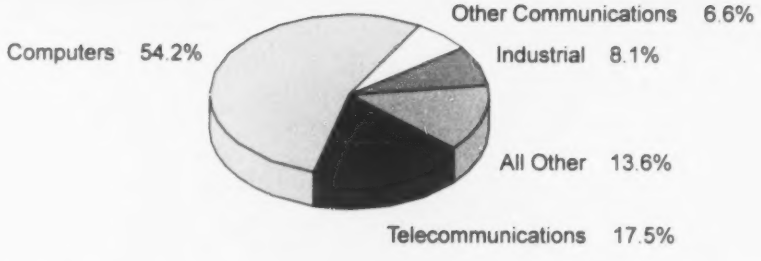
SOURCE: The World Factbook 1992, CIA

RUSSIA: IMPORTS & EXPORTS (U.S. $ Millions)

	U.S. Imports 1992	U.S. Exports 1992
Electron Tubes	0.2	0.2
Passive Components	0.1	6.9
Solid State Products	0.1	0.8
Consumer Electronics	0.0	4.4
Telecommunications	0.8	27.3
Other Communications	0.1	10.3
Computers & Peripherals	0.0	84.6
Industrial Electronics	0.0	12.6
Electromedical Electronics	0.0	8.9
TOTALS	1.3	156.0

SOURCE: U.S. Department of Commerce

U.S Electronics Exports To Russia, 1992



Source: U.S. Department of Commerce

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SPAIN

SPAIN: ECONOMIC PROFILE
POPULATION: 39.1 million

	1990	1991	1992[e]
GDP (US $ billions)	490.8	526.2	547.0
Real GDP Growth Rate (%)	3.6	2.[illegible]	1.3
GDP Per Capita (U.S. $)	12,489	13,694	13,989
Inflation (%)	6.5	5.5	5.4
Unemployment (%)	16.1	17.0	18.4
Avg. Exchange Rate (Pesetas per U.S. $)	102.0	104.1	101.4

[e]-estimate
SOURCE: U.S. Department of Commerce

SPAIN: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.0	0.0	2.3	2.5
Passive Components	14.5	15.0	76.2	44.2
Solid State Products	64.0	44.8	37.9	42.4
Consumer Electronics	0.7	1.2	33.8	39.9
Telecommunications	1.2	1.2	114.1	164.1
Other Communications	6.6	6.5	29.7	42.8
Computers & Peripherals	16.3	15.7	344.2	372.9
Industrial Electronics	8.1	7.8	86.4	93.6
Electromedical Electronics	10.4	10.0	46.8	50.7
TOTALS	121.8	102.2	771.4	853.1

SOURCE: U.S. Department of Commerce

SPAIN: ELECTRONICS INDUSTRY, 1991 ($ millions)

	PRODUCTION	IMPORTS	EXPORTS
Consumer Electronics			
Portable Audio	0.0	179.6	0.0
Home Audio Components	60.6	214.3	52.9
Audio Compacts & Combinations	19.2	115.0	9.6
Car Audio	0.0	92.2	0.0
Color TV (portable)	382.8	65.1	175.1
Color TV	683.0	300.6	351.8
Videocassettes	109.5	210.6	25.3
Camcorders	0.0	292.6	0.0
TOTAL Consumer Electronics	1,255.2	1,469.9	614.8

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SPAIN

SPAIN: ELECTRONICS INDUSTRY: 1991 ($ millions)

	PRODUCTION	IMPORTS	EXPORTS
Components			
Tubes	86.4	201.4	15.2
Semiconductors	174.4	416.0	134.5
Condensors	55.5	81.7	41.2
Resistors	26.1	46.6	22.0
Inductive Components	76.4	72.9	34.5
Electroacoustic Components	22.3	40.2	6.3
Antennas	149.2	93.5	22.9
Printer Circuits	138.1	53.9	43.1
Electromechanical Components	76.5	236.3	79.3
Other	78.0	180.4	27.2
TOTAL Components	844.3	1,401.8	406.6

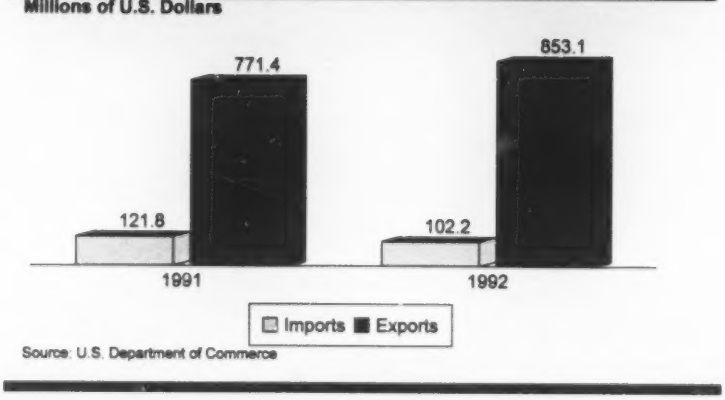
SPAIN: ELECTRONICS INDUSTRY: 1991 ($ millions)

	PRODUCTION	IMPORTS	EXPORTS
Professional Electronics			
Defense, Detection, Navigation	320.4	33.2	72.4
Industrial Electronics	339.7	903.0	120.5
Electromedical	88.1	598.1	38.9
Radio & TV Broadcast	146.3	282.0	15.3
Instruments & Didactic Equipment	52.7	356.3	47.6
TOTAL Professional	947.2	2,172.7	294.7

SPAIN: ELECTRONICS INDUSTRY: 1991 ($ millions)

	PRODUCTION	IMPORTS	EXPORTS
Telecommunications	2,649.0	1,089.2	451.9
Computers & Information Technology	1,274.4	4,351.1	1,209.7

U.S. Electronics Trade With Spain



Source: U.S. Department of Commerce

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SWEDEN

SWEDEN: ECONOMIC PROFILE
POPULATION: 8.5 million

	1990	1991	1992[e]
GDP (U.S. $ billion)	230.6	229.8	227.0
Real GDP Growth Rate (%)	0.9	(1.3)	(1.1)
GDP Per Capita (U.S. $)	27,447	26,898	26,700
Inflation (% change in CPI)	10.4	10.1	5.2
Unemployment (%)	1.5	3.1	5.2
Avg. Exchange Rate (Kronor per U.S. $)	5.92	6.09	6.20

[e]-estimate
SOURCE: U.S. Department of Commerce

SWEDEN: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.1	0.1	4.1	4.1
Passive Components	61.8	36.2	51.9	31.1
Solid State Products	17.4	17.7	39.2	55.2
Consumer Electronics	0.6	0.6	11.1	11.6
Telecommunications	196.7	157.2	73.1	65.6
Other Communications	13.8	11.0	51.9	46.5
Computers & Peripherals	87.7	104.6	301.6	319.6
Industrial Electronics	46.2	55.1	71.3	75.6
Electromedical Electronics	24.1	28.7	84.1	89.1
TOTALS	448.4	411.2	688.3	698.4

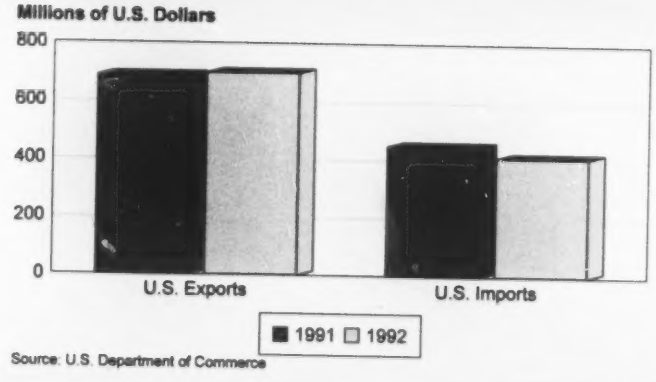
SOURCE: U.S. Department of Commerce

SWEDEN: ELECTRONIC CONNECTORS ($ Millions)

	1989	1990	1991
Imports	418.0	467.0	469.0
Production	543.0	651.0	654.0
Exports	245.0	280.0	281.0

SOURCE: American Embassy, Stockholm, Sweden

Sweden-U.S. Electronics Trade



Source: U.S. Department of Commerce

SWITZERLAND

SWITZERLAND: ECONOMIC PROFILE
POPULATION: 6.9 million

	1990	1991	1992[e]
GDP (U.S. $ billions)	225.9	232.6	na
Real GDP Growth Rate (%)	2.2	(0.5)	(0.5)
GNP Per Capita (U.S. $)	34,678	35,256	na
Inflation (%)	5.4	5.2	3.4
Unemployment (%)	0.6	1.3	3.0
Avg. Exchange Rate (Swiss franc per U.S. $)	1.39	1.43	1.38

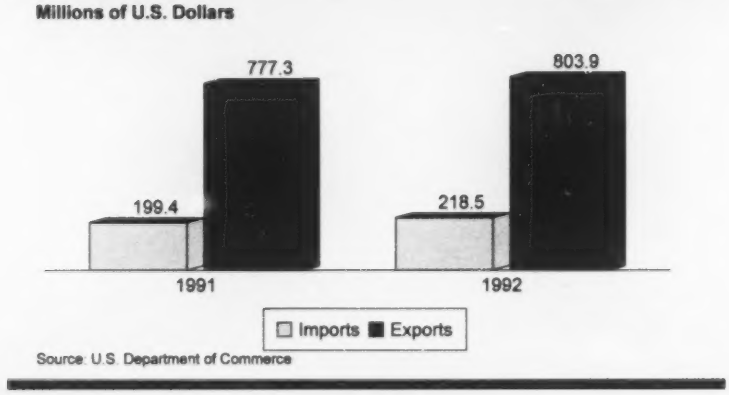
[e] - estimate
SOURCE: U.S. Department of Commerce

SWITZERLAND: U.S. IMPORTS/EXPORTS ($ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	1.2	1.1	2.4	3.0
Passive Components	55.7	61.2	49.6	46.2
Solid State Products	6.0	5.7	49.2	54.8
Consumer Electronics	6.4	6.9	24.0	22.8
Telecommunications	3.7	5.9	54.8	63.7
Other Communications	3.4	5.4	55.3	64.3
Computers & Peripherals	22.7	24.4	361.8	366.6
Industrial Electronics	81.8	88.0	108.7	110.1
Electromedical Electronics	18.5	19.9	71.8	72.4
TOTALS	199.4	218.5	777.3	803.9

SOURCE: U.S. Department of Commerce

U.S. Electronics Trade With Switzerland



Source: U.S. Department of Commerce

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TURKEY

TURKEY: ECONOMIC PROFILE
POPULATION: 59 million

	1990	1991	1992[e]
GNP (current $ billions)	151.1	151.9	135.0
Real GNP Growth Rate (%)	9.9	0.3	4.5
GNP Per Capita (U.S. $)	1,920	2,605	2,305
Inflation (%)	50.0	71.1	66.0
Unemployment (%)	7.7	7.3	
Avg. Exchange Rate (Liras per U.S. $)	2,874	4,848	9,022

[e]-estimate
SOURCE: U.S. Department of Commerce

TURKEY: U.S. IMPORTS/EXPORTS (U.S. $ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	0.0	0.0	2.4	2.8
Passive Components	0.1	0.0	25.3	15.1
Solid State Products	0.0	0.0	6.7	5.2
Consumer Electronics	0.2	0.1	4.8	4.0
Telecommunications	0.0	0.0	29.6	36.6
Other Communications	0.0	0.0	43.5	53.8
Computers & Peripherals	0.4	0.2	49.6	50.8
Industrial Electronics	0.0	0.0	24.6	25.2
Electromedical Electronics	0.0	0.0	19.6	20.1
TOTALS	0.7	0.3	206.1	213.6

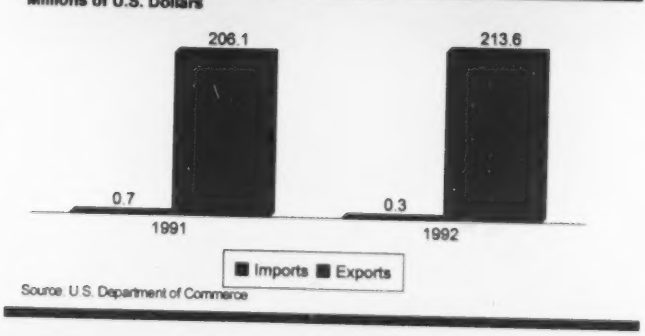
SOURCE: U.S. Department of Commerce

TURKEY: STATUS OF ELECTRONIC INDUSTRY, 1989 ($ millions)

	IMPORTS	EXPORTS	PRODUCTION
Components	415.6	6.7	47.3
Consumer Electronics	50.8	131.4	788.9
Telecommunications	205.1	27.4	249.3
Other Professional & Industrial Equip.	423.5	1.8	38.8
Defence Electronics	n/a	9.0	33.6
TOTAL	1,095.0	176.3	1,157.9

SOURCE: 1990 Almanac Turkish Electronic Industry

U.S Electronics Trade With Turkey



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UNITED KINGDOM

UNITED KINGDOM: ECONOMIC PROFILE

POPULATION: 57.7 million

	1990	1991	1992[e]
GDP ($ billions)	960.9	1,018.0	1,008.0
Real GDP Growth Rate (%)	0.8	(2.2)	(1.0)
Real GDP Per Capita (U.S. $)	13,000	12,900	12,786
Inflation (%)	9.5	5.8	3.8
Unemployment (%)	5.8	8.3	10.5
Avg. Exchange Rate (U.S. $ per Pound)	1.64	1.78	1.77

[e]-estimate

UNITED KINGDOM: U.S. IMPORTS/EXPORTS (U.S. $ millions)

	U.S. Imports		U.S. Exports	
	1991	1992	1991	1992
Electron Tubes	26.5	26.3	42.1	33.9
Passive Components	171.5	153.3	347.5	296.0
Solid State Products	229.8	285.3	889.0	1,116.7
Consumer Electronics	41.6	40.6	100.9	116.3
Telecommunications	132.4	200.2	446.3	514.0
Other Communications	86.1	130.1	172.2	198.3
Computers & Peripherals	907.8	1,035.1	2,956.0	3,044.8
Industrial Electronics	349.8	398.8	494.2	509.1
Electromedical Electronics	77.4	88.3	173.0	178.2
TOTALS	2,022.9	2,358.0	5,621.2	6,007.3

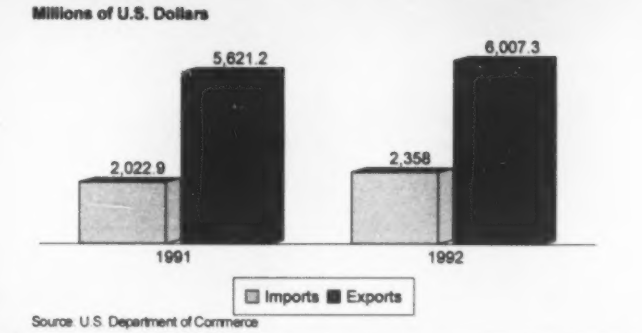
SOURCE: U.S. Department of Commerce

UNITED KINGDOM: CONSUMER PURCHASES OF VIDEO PRODUCTS (in thousands of sets/units)

	1990	1991	1992
Color TV up to 17"	1,700	1,670	1,819
Color TV over 17"	1,753	1,662	1,780
Video Cassette Recorder	2,150	2,164	2,217
Camcorder	366	512	609

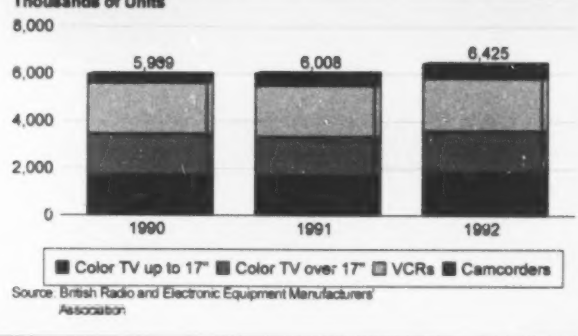
SOURCE: The British Radio and Electronic Equipment Manufacturers' Association

U.S. Electronics Trade With The U.K.



Source: U.S. Department of Commerce

U.K. Consumer Purchases of Video Products



Source: British Radio and Electronic Equipment Manufacturers' Association

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The Voice of the Telecommunications Equipment Industry

TIA represents more than 500 small, medium and large companies which provide materials, products, systems, distribution services and professional services to the United States and countries around the world. TIA's members manufacture nearly all of the products used in the modern telecommunications network.

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TRADE SHOWS AND MARKETING EVENTS

TIA sponsors, with the United States Telephone Association, SUPERCOMM, the largest annual telecommunications exhibition in the world. TIA also sponsors or participates in numerous domestic and international trade shows around the world to gain further exposure for its members' products.

SUPERCOMM '93

Dates to remember:

- SUPERCOMM '94
  May 2-5, 1994, New Orleans, LA
- SUPERCOMM '95
  March 20-23, 1995, Anaheim, CA
- TELECOM '95
  October 3-11, 1995, Geneva, Switzerland
- SUPERCOMM '96
  June 24-27, 1996, Dallas, TX

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GLOSSARY OF TERMS

A

Amateur Radio--two-way radio dedicated to noncommercial use by licensed radio amateurs; commonly known as "HAM" radio

Antenna Lead-In Wire--wire used to connect an antenna to a receiver or transmitter

Antenna Amplifier--an amplifier that is placed between an antenna and a piece of equipment

Artificial Intelligence--relies on computer systems that use symbolic rather than algorithmic methods of problem solving to emulate human intelligence

Audio Transformer--an iron core transformer used for coupling audio circuits

B

Backward Wave Oscillator--travelling wave device used in microwave and radar applications

Bandwidth--a defined range of frequencies for transmission signals, for example the bandwith for AM is 530-1760 Mhz

Bipolar Device--a current driven device with two poles

Bipolar Integrated Circuit--IC that uses bipolar transistor technology

Bipolar Logic--digital logic ICs that use bipolar transistor technology

Bipolar Memory--memory devices that use bipolar transistor technology

Blank Media--a storage media, either analog or digital, upon which information is recorded such as an audio cassette or floppy disk

Brilliant Pebbles--a subset of the Strategic Defense Initiative; small electronically guided projectiles designed to orbit the earth, and collide with incoming missiles when directed

Bypass Capacitor--a capacitor that provides a path for RF (radio frequency) signals to be conducted away from a circuit element

C

Cable TV Equipment--devices and components designed to transmit TV signals via cable. Includes converter boxes, cable, and switching equipment

Capacitor--a two conductor device which uses a dielectric material between them to store energy, block DC or pass AC, depending on its value and frequency; component capable of storing energy

Carbon Composition Resistor--electrical resistance element made from carbon; resistor is capable of withstan ing both temperature and transient electrical shock

Carbon Film Resistor--resistor in which the resistance element is a film of carbon vacuum-deposited on ceramic; largely used in consumer products

Carrier Current Communications System--transmission and reception of voice, pictures, telemetry etc. by means of RF energy conducted by wire lines which are used for another purpose (power or telephone); also known as wired radio

Carrier Line Equipment--used for multiple channel carrier communication

Cathode Ray Storage Tube--a CRT that stores an image for review; often used in oscilloscopes and other test instruments

Cathode Ray Tube-- a device in which an electron beam is focused on a phosphor screen and is deflected to give a visible display; extensively used in oscilloscopes, radars, and TVs

Cellular--terrestrial mobile telephone technology; signals are transmitted by a system of repeaters which are connected to a telephone switching office

Central Office--local telephone company's centralized switching equipment and outside plant where calls are switched onto the local network or long distance network

Character Recognition--scanners used in conjunction with software to recognize ordinary printed text; pen-based computers are emerging which recognize handwritten words

Chip--a bare semiconductor die; see Die

Chip Resistor--subminiature resistor formed on a chip; often used with surface mount assemblies and hybrid circuits

Citizens Communications Equipment--used for two-way communications; commonly known as CB radio

Clock Speed--measures a microcomputer's power to process information, usually stated in megahertz

Closed Circuit TV Equipment--TV system in which camera and receiver are linked by cable or microwave

Coaxial Cable--has two conductors-an inner conductor that is shielded by an outer conductor that is usually braided; example is cable TV cable

Color Tubes--see Picture Tube

Compact Stereo System--one-brand stereo system designed for tabletop or bookshelf use which is not battery operated and is not sold in a rack

Computerized Tomography--equipment which converts signals generated by X-ray beams into body sections images on a screen; commonly known as CAT-scans

Connector--any device which facilitates electrical circuit connections and disconnections; often classed by application such as coaxial, PCB, fiber optic etc.

Console Television--TV which is built into its own cabinet, intended to stand on the floor

Counter Measurers Equipment--devices used to impair the operational effectiveness of enemy activity, for example radar jamming equipment

Coupler--a component which is used to transfer energy from one circuit to another, for example a coupler to join fiber optic cable

Cross Field Amplifier--tube that employs crossed electric and magnetic fields to convert DC power into microwave energy

Crystal Blank--uncut crystal

Crystal Filter--a filter to block unwanted frequencies using one or more piezo-electric crystals

Crystal Oscillator--an oscillator which uses a piezo-electric crystal of quartz to control frequency

Current--rate of transfer of electricity from one point to another; measured in amperes

Current Mode Logic--transistor logic in which the transistors operate in the unsaturated mode

Customer Premises Equipment--privately owned telecommunications and computer equipment (telephones, fax machines etc.) as opposed to equipment provided by the telephone company

D

Data Compression Technology--the ability to reduce the number of bits required to represent information in a computer's storage area, for example, a two megabyte file can be compresses to a one megabyte file with no loss of information

Defibrillator--equipment which applies electrical current to stimulate the heart muscle to contract and attempt to restart

Delay Line--a device which introduces a time lag into a signal

Diathermy Apparatus--equipment used to mimic the function of the kidneys and cleanse the blood of impurities; commonly known as dialysis

Die--a tiny uncased integrated device obtained from a semiconductor wafer; known as a chip; plural is dice

Digital Radiography--computerized system which enhances and manipulates x-ray information coming from existing x-ray equipment

Diode--a two-way element (cathode and anode) receiving tube or semiconductor device

Direct Access Storage--devices which write and read computer information to/from a hard magnetic storage disk or floppy diskette

Direct Broadcast Satellite--a system using a higher-powered satellite with smaller ground dishes

Direct View Television--TV system wherein the image is viewed directly on a picture tube in contrast to indirect viewing systems such as projection TV

Dosimetry--measurements or calculations of delivered doses of radiation; measured by dosimeters

E

Electrocardiograph--equipment which measure the electrical activity of the heart

Electroencephalograph--equipment which measures electrical activity of the brain

Electrolytic Capacitor--the dielectric is a thin film of oxide formed by electrolytic action on aluminum foil which acts as the positive plate, the electrolyte acts as negative plate (see also "capacitor")

Electromyocardiograph--instrument for graphing the action of the heart muscle

Electron Tube--a device in which conduction occurs by the movement of electrons or ions between electrodes in a vacuum or ionized gas within a gas-tight envelope

Electronic Wave Filter--device used in TVs and monitors/receivers to eliminate adjacent channel interference; also known as Surface Acoustic Wave Filter

Electro-Optical Device--a device that uses light to operate; opto-isolators are the most common; however many electronic devices use light or create light such as CRTs, LCDs, LEDs, photodetectors, solar cells, etc.

Electrostatic Capacitor--solid material (i.e., paper, film, ceramic) used as the dielectric which is used to store energy

Emitter Coupled Logic--bipolar form of digital logic

Endoscopic Equipment--examines the interiors of bodily canals such as the throat

Expert System--program which embodies expertise about something and allows user to ask certain questions about that expertise

F

Facsimile Equipment--device which allows a paper message to be scanned optically, translated into digital signals, and sent over telephone lines to a receiving machine that reconstructs the image; commonly known as fax machine

Fiber Optic Cable--strands of clear, glass fibers to carry large amounts of signals in the form of light pulses

Filter--a device that passes a desired frequency and blocks out others

Flash Memory--a high volume, solid state random access memory (RAM) storage device that retains information in the absence of a continuous power flow

Flat/Ribbon Cable--flexible, metal wire that has the insulation connected in such a way to make it flat like a ribbon

Force Multiplier--a military term used to denote the increase of fighting capability through additional sophisticated weaponry rather than adding more personnel into the equation

Frequency--the number of times an electrical waveform changes in one second; measured in hertz, for example AM radio has a frequency of 530-1760 megahertz

Fuzzy Logic--type of computer logic that deals with problem solving using imprecise information such as "almost" and "nearly"

G

Gas & Vapor Tube--tube that is filled with a gas that conducts when a certain voltage is reached

Geophysical Equipment--equipment used for measuring the physical properties of the earth as influenced by underground mineral and oil deposits

H

Harbor--refers to Harbor infrastructure upgrades

High Definition TV--a high resolution TV incorporating 1000 plus lines of resolution, wide aspect ratio, and digital quality sound

High-Vacuum Tube--tube that does not contain enough gases to ionize

Home Satellite Earth Station--satellite dish, antenna, or other ground-based equipment that can receive/transmit to a satellite

Hook-Up Wire--used to connect circuit elements together

Hybrid Integrated Circuit--a circuit that contains more than one discrete component in combination with ICs to make a single encapsulated unit

I

IFF Equipment--equipment used for Identification of Friend or Foe in defense related situations

Image Processing--the ability of a computer via software to store and process images; scanners and color printers serve as input/output devices; requires the ability to compress and decompress files to limit the amount of storage

Impedance--opposition to the flow of AC; depends on both resistance and reactance

Inaudible Subcarrier--a means by which digital radio signals can carry non-audio information such as LED readouts

Industrial Electronics--programmable devices which enhance productivity in discrete manufacturing processes

Infra-red--invisible light rays considered to be heat radiation

Integrated Circuit--combination of interconnected circuit elements combined on a base material (e.g., silicon) capable of performing a circuit function in an extremely small size; known as an integrated microcircuit

Intelligent Highway--the use of computer technology applied to automobiles, transportation systems, and highways to optimize traffic flow; also known as Smart Highways and Intelligent Vehicle Highway System

Intercommunications System-- simple two-way telephone or low powered radio system for use on the premises of a building; commonly known as intercom systems

Intermediate Frequency Transformer--used in radio & TV receivers to allow amplification of a low level RF signal

K

Key System--a multi-line telephone system designed to provide shared access to several outside lines through buttons or keys on the handset; common business telephone for small or medium sized companies

Klystron--an electron tube in which the electrons are bunched periodically by electric fields; used as an oscillator or amplifier in UHF applications

L

Laser--Light Amplification by Stimulated Emission of Radiation; a beam of light which is cohesive, highly directed and intense

Light Emitting Diode--a semiconductor device designed to emit light when activated by voltage; usually red or green, LEDs are used in readout displays

Light Sensitive/Emitting Device--device that emits or senses light in a circuit

Light Sensitive Diode--semiconductor diode useable as a photoconductive cell

Linear Bipolar--linear circuits that use bipolar transistor technology

Liquid Crystal Display--a system of readout using reflecting light via electrical stimulation; commonly used for watches, calculators, and TVs

M

Magnetic Resonance Imaging--imaging of the human body based on the interaction of atoms with strong magnetic fields and radio waves. A computer forms two or three dimensional images for analysis

Magnetron--a two-element microwave tube in which the electron stream is subjected to a magnetic field to produce an AC power output; used as an oscillator in microwave radio and radar

Memory Card--a removable, small card primarily used in handheld or pocket computers which lack conventional disk drives

Metal Film Resistor--resistor in which the resistance element is a metal alloy vacuum deposited on ceramic; layer created is classified as thick or thin film

Metal Oxide Semiconductor--a process in which an oxide or nitride is used as a dielectric layer between metal and semiconductor

Meteorological Equipment--equipment used for measuring atmospheric conditions, particularly weather cond tions

Microcontroller--semiconductor-sized process control device

Microprocessor--a primary semiconductor chip inside computers and other digital devices

Microwave Diode--a diode that converts DC to microwaves by using negative resistance

Microwave Filter--a filter that consists of resonant cavity sections built into a microwave transmission line to pass desired frequencies and reject others

Microwave System--uses extremely short radio waves or microwaves to transmit and receive radio, television and control signals

Microwave Tube--tube that operates at microwave frequencies; used extensively in radar and communication systems

Military Mapping--the practice of encoding a semiconductor with a topographical map to guide a missile to its intended target

Miniature Printed Circuit Mounted Relay--relay soldered to a PCB rather than plugged into a socket

Mixer--audio device used by musicians which accepts several signal inputs and enables the user to manipulate the volume and other characteristics of each channel input, creating a single, "mixed" output

Mobile Radio System--communications between one mobile station and another or between mobile and fixed stations; also known as mobile communications

Mobile Vehicular System--includes both transmitters and receivers which can operate in transit

Modem--device used to connect a computer to a telephone line

Monochrome Tubes--see Picture Tube

Monolithic, Bipolar IC--an IC made with bipolar transistor technology; used in high speed computers for logic circuits

Monolithic Integrated Circuit--all elements are formed within a single semiconductor chip

Monolithic, Linear IC--an IC that provides linear amplification of signals as contrasted to a digital IC which controls pulses

Monolithic, MOS IC--an IC made with MOS transistor technology; used as memories, microprocessors, and microcontrollers

Multichannel Analyzer--electronic device for sorting photons of different energies according to energy levels

Multichip Module (MCM)--a collection of semiconductor devices packaged much like a printed circuit board. Chips in a MCM occupy about half the space of a printed circuit board, require as much as half the power, and provide higher performance

Multilayer Board--completely processed printed circuit configuration consisting of alternating layers of conductive patterns and insulating materials bonded together

Multilayer Capacitors--capacitor that consists of 2 conducting surfaces separated by insulating material so that electrical energy may be stored; ceramic is usually the sandwiched dielectric

Multimedia--presentation of text, graphics, animation, audio, and video that can be viewed on a computer or other output screen

Multimeter--electronic instrument capable of measuring more than one electrical property

Multiplexing Equipment--allows for the transmission of two or more signals to be carried simultaneously on a single communications channel

Multitasking--the ability to perform two or more simultaneous computer applications by means of specialized operating systems/software

Musical Instrument Digital Interface--communication of musical instruments with one another through digital communication links; allows functions/sounds from one electronic device to be accessed or controlled by another

N

Neural Network--system of interconnected processing units patterned after neurons in the human nervous system that sometimes can be self-organizing and capable of learning

Nuclear Electronics--instruments which perform radiation detection, measuring and control functions

O

Optical Disk--similar to a CD; disks are encoded by lasers and used for storing information; formats include read-only, write-once, and erasable

Optical Scanning Device--transfers optical copies of printed material into computer readable formats. Includes devices capable of character recognition.

Original Equipment Manufacturer--manufacturer that buys components from other companies and assembles them into finished goods

Oscilloscope--test instrument used in electronic circuit and device design, circuit diagnosis, equipment mainte nance, and product manufacture

Oscillator Crystal--a cut and polished crystal that is used to control accurately the frequency of an oscillator

P

Particle Accelerator--machine in which charged particles such as neutrons are given high velocity for use in atomic disintegration

Passive Component--a electrical component which does not change its character when an electrical impulse is applied

Passive Network--a combination of circuit elements such as resistors, capacitors, or inductors which have no source of energy

Peripheral Equipment--devices used in conjunction with a computer including monitors, printers, CD-ROM players, mice, scanners, etc.

Photomultiplier Tube--a photo-emissive tube in which the liberated photo-electrons are directed into an electron multiplier to give an enhanced current output.

Photosensitive Cells--possess the ability to absorb photons of light to liberate electrons; Includes photo-emissive, photoconductive, and photo-voltaic effects

Picture Tube--a cathode-ray tube with a light-emitting layer of luminescent material inside known as phosphor. As electrons scan this layer, the phosphor emits light and a picture is created on the TV screen. Color and monochrome TVs each require a variation of the picture tube

Piezoelectric Device--a device that converts electrical energy into force or vice versa

Plate and Filament Transformer--transformer used to supply power to electron tube elements, plates or filaments

Point-to-Point--method of programming robot; movements are linear between points

Power Diode--diode used in power equipment such as motors and power supplies

Power Transistor--transistor having a dissipation rating of one or more watts

Power Tube--tube capable of handling larger power than the ordinary tube; being replaced by semiconductors as their power capacity increases

Printed Circuit Board--a part manufactured from a rigid base material upon which a completely printed circuit has been formed

Private Branch Exchange--private telephone switching system located on the customer's premises; provides pooled access to a group of lines typically by dialing "9"

Process Control Devices--computerized devices which typically control a manufacturing process

Proximity Fuses--detonates a warhead when the target is within the specified region

Pulse-Height Analyzer--instrument capable of separating out pulses absorbed by photons of different energy levels according to the voltage height of the pulse produced

Pulse Transformer--a transformer capable of operating over a wide range of frequencies

Q

Quartz Crystal--a crystal composed of silicon dioxide from which plates are cut and a current is passed through

R

Rack Stereo System--a one-brand, full size, complete stereo system sold in a rack or cabinet

Radar--system using beamed and reflected energy to detect and locate objects

Radio Astronomy Equipment--detects radiowaves emitted by astronomical bodies

Radio Communications--telecommunications by means of radio waves

Radio Frequency Interference--annoying electrical noise in RF amplifiers; undesired radio frequency signals that compete with desired ones

Random Access Memory--a memory device in which information can be independently stored or retrieved; usually bits of information are only stored temporarily

Read Only Memory--a memory device in which information is permanently stored during its manufacture or installation and cannot be erased

Receiving Tube--tube used in receiving equipment

Receiver--a device on the transmission line that converts the signal to whatever type of signal is needed to complete the transmission

Rectifier--converts AC into DC

Rectifier Diode--diode used for converting AC into DC for power supply units

Relay--a device which is electrically controlled to mechanically open and close electrical contacts in a circuit

Repeater--devices which simultaneously retransmits a signal it receives from another source; extends the service area of the original station

Resistance--opposition that a material offers to the flow of electric current; measured in ohms

Resistor--an electrical component made of a material which has a known resistance and opposes the flow of electric current, generating heat; designed to limit current flow or drop a voltage

RF Choke--a coil of wire that creates a block to RF signals entering a circuit; used at the input of an audio frequency amplifier

RF Coil--a coil of wire that is tuned to a certain frequency

RFI/EMI Control Filter--filter used to limit RF from undesired circuits

Robot--instrument which is programmed and can be reprogrammed to perform a task(s)

S

Sampling Unit/Keyboard--device which records a sound digitally onto a silicon chip

Satellite Communications System--allows satellites in orbit to reflect and retransmit radio waves between terrestrial transmitters and receivers

Scaler--instrument which records radioactivity as counts

Semiconductor--any material with an electrical conductivity between that of an insulator and a conductor (e.g., silicon); loosely used to describe devices such as diodes and transistors

Semiconductor Disk Drive--data is stored inside electronic chips which are mounted on boards or removable memory cards

Semiconductor Rectifier--a component which conducts current in one direction and inhibits the flow of current in the other direction by using the properties of a semiconductor device such as silicon

Sensitive Relay--a relay that will operate at small currents, usually below 10mA

Sequencer--unit which contains sampled sounds and is able to arrange these sounds into multi-tracked arrangments

Servo-Controlled Robot--operates in a closed-loop system with sensors so that continuous feedback is provided

Signal Diode--diode that is used in handling low voltage AC signals

Signal Generator--source of AC current of accurately known characteristics

Signal Processor--device which accepts the input of an electronic musical instrument, or any audio source, which manipulates (digitally, in most cases) the sound by adding various desired effects such as reverb, chorus, delay, etc.

Signal Transistor--transistor having a dissipation rating of less than one watt

Socket--a fixture into which a plug, tube, or transistor is inserted for easy installation in, or removal from, a circuit; differs from a connector

Solid State--a technology in which components and circuits are made from semiconductor materials such as silicon

Sonar--equipment used for underwater detection and communication using sonic pulses

Sound Module--a unit which stores effects (reverb, delay, etc.) from which a synthesizer can draw

Spectrum Analyzer--a test instrument which scans through a frequency spectrum and displays a plot of amplitude versus frequency of the signals present at its input

Splitter--a device that allows multiple wires to be connected to a single wire; usually for RF signals

Surface Mounting--a miniaturization technology of soldering directly to copper pathways on printed circuit boards without holes, wires, or leads

Surround Sound--system of audio reproduction that uses four or more speakers to simulate the full three-dimesional effect of a live performance

Switch--a mechanical device for making connections in a circuit; often classed by switch action such as toggle, slide, rotary, etc.

Switching Equipment--establishes and routes communication paths between separate extensions

T

Telecommunications--any communication process that allows the transmission of information from a sender to a receiver by means of a electromagnetic or light wave medium

Teleprinter--equipment used in a printing telegraph system (e.g., Telex); also known as a teletypewriter

Testing & Measuring Equipment--instruments which measure, test, and analyze a range of electronic variables such as current, resistance, capacitance, inductance, frequency, and waveform

Tetrode Tube--an electron tube with 2 grids between the cathode and anode, that nearest the cathode being the control grid and the other carrying a fixed positive basis

Thick Film Resistor Network--a method for connecting a number of discrete resistors; used for high volume applications and surface mounting assemblies

Thin Film Resistor Network--a method for connecting a number of discrete resistors; used for applications which require tight tolerances and precise resistance values

Through the Hole Mounting--assembly technology by which components are positioned and inserted through drilled holes on a PCB before they are soldered

Thyristor--semiconductor device which can be controlled on/off by a signal applied to a gate which serves as a switch

Timing Relay--a relay that operates on a timing sequence

Toroid--a coil or transformer wound on a doughnut-shaped core

Transceiver--a combination of a radio transmitter and receiver housed together and sharing some components

Transducer--device which converts one type of energy into another

Transformer--used to raise or lower AC voltages or to insulate one AC circuit from another by magnetic coupling

Transistor--an active semiconductor device having 3 or more electrodes; usually made of germanium or silicon, the output current can be controlled by the signal(s) applied to one or more input terminals

Transistor to Transistor Logic--a widely used, high-speed, medium power dissipation inexpensive form of semiconductor logic; basic logic element is a multiple emitter transistor

Travelling Wave Tube--an electron tube in which a stream of electrons interacts continuously with a guided electromagnetic wave moving in sync with it so that there is a transfer of energy to it; used extensively for microwave amplifiers and defense applications

Triode Tube--an electron tube with three electrodes including a cathode, anode, and control grid

U

Ultrasonic--an acoustic frequency which is above the range audible to the human ear; can be used for medical therapy

V

Voice Frequency Equipment--designed to transmit and decode the electrical characteristics of voice waves and to minimize the occupied bandwidth of voice signals

Voice Recognition Synthesis--a form of input/output device in the form of software which provides a user with ability to control applications by speech

Voltage--the electrical pressure that exists between two points and is capable of producing a flow of current when a circuit is connected between the two points; measured in volts

W

Wafer--a thin disc of semiconductor material from which chips are fabricated and subsequently separated and packaged

Watt-Hour Meter--instrument used to measure consumed energy such as a residential electric meter

Waveform--describes the shape of a wave disturbance; can have infinite number of forms

Wire & Cable--conductors used to transmit a signal from one place to another

Wirewound Resistor--resistor consisting of essentially resistance wire wound into a coil on a cylindrical core; favored for high temperatures and stability

Z

Zener Diode--a two layer semiconductor diode designed to be operated in the reversed-biased breakdown condition; used for voltage reference purposes or for voltage stabilization

GLOSSARY OF ACRONYMS

A

AC--Alternating Current

ADA--Americans with Disabilities Act

AEC--Architectural, Engineering and Construction

AI--Artificial Intelligence

ASIC--Application Specific Integrated Circuit

ATD--Advanced Technology Demonstration

B

BA--Budget Authority

BE--Brilliant Eyes

BIOS--Basic Input/Output System

BP--Brilliant Pebbles

BWO--Backward Wave Oscillator

C

C3--Command, Control, and Communications

CAD--Computer Aided Design

CAE--Computer Aided Engineering

CAM--Computer Aided Manufacturing

CAT--Computerized Axial Tomography

CATV--Cable TV

CB--Citizen's Band

CCTV--Closed Circuit TV

CD--Compact Disk

CD-ROM--Compact Disk-Read Only Memory

CEBus--Consumer Electronics Bus

CFA--Cross Field Amplifier

CIM--Corporate Information Management

CML--Current Mode Logic

CO--Central Office

COTS--Commercial-off-the-Shelf

CRT--Cathode Ray Tube

D

DARPA--Defense Advanced Research Projects Agency

DBS--Direct Broadcast Satellite

DC--Direct Current

DCC--Digital Compact Cassette

DDR&E--Director of Defense Research and Engineering

DoD--Department of Defense

DOE--Department of Energy

DOT--Department of Transportation

DRAM--Dynamic Random Access Memory

E

E(2)I--Endo-Exo Atmospheric Interceptor

ECG--Electrocardiograph

ECL--Emitter Coupled Logic

EDA--Electronic Design Automation

EEG--Electroencephalograph

EIA--Electronic Industries Association

EIF--Electronic Industries Foundation

EMG--Electromyocardiograph

EMI--Electromagnetic Interference

EEPROM--Erasable Electronic Programmable Memory

EPROM--Electronic Programmable Memory

ERINT--Extended Range Interceptor

F

FAA--Federal Aviation Administration

FCC--Federal Communications Commission

FM--Frequency Modulation

FY--Fiscal Year

G

GBI--Ground Based Interceptor Missile

GIS--Geographic Information Equipment

GOCO--Government-Owned, Contractor-Operated

H

HDTV--High Definition TV

HHS--Department of Health and Human Services

I

IAFIS--Integrated Automated Finger Printing Identification System

IC--Integrated Circuit

IF--Intermediate Frequency

IFF--Identification, Friend or Foe

IRS--Internal Revenue Service

IVHS--Intelligent Vehicle Highway System

L

LASER--Light Amplification by Stimulation Emission of Radiation

LCD--Liquid Crystal Display

LED--Light Emitting Diode

M

MCM--Multichip Module

MD--Mini Disc

MIDI--Musical Instrument Digital Interface

MOS--Metal Oxide Semiconductor

MRI--Magnetic Resonance Imaging

N

NASA--National Aeronautics and Space Administration

NCIC--National Crime Information Center

NMD--National Missile Defense

O

OEM--Original Equipment Manufacturer

OSD--Office of the Secretary of Defense

P

PA--Public Address

PBX--Private Branch Exchange

PC--Personal Computer

PCB--Printed Circuit Board

PDA--Personal Digital Assistants

PIC--Personal Intelligent Communicators

R

R&D--Research and Development

RADAR--Radio, Detecting, and Ranging

RAM--Random Access Memory

RBDS--Radio Broadcast Data System

RDT&E--Research, Development, Test & Evaluation

RF--Radio Frequency

RFI--Radio Frequency Interference

ROM--Read Only Memory

S

S&T--Science and Technology

SAW--Surface Acoustic Wave Filter

SDIO--Strategic Defense Initiatives Organization

SMD--Surface Mount Device

SMT--Surface Mount Technology

SOF--Special Operations Forces

SONAR--Sound Navigation and Ranging

T

TAD--Telephone Answering Device

THAAD--Theater High Altitude Area Defense

TTL--Transistor to Transistor Logic

TWT--Travelling Wave Tube

U

UHF--Ultra High Frequency

USSOCOM--US Special Operations Comment

V

VHS--Video Home System

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